

- A. Specifications for this project are arranged in accordance with the Construction Specification Institute numbering system and format. Section numbering is discontinuous and all numbers not appearing in the Table of Contents are not used for this Project.
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## SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Related Requirements:
  - 1. Section 09 51 23 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with fully concealed suspension systems, stapling, or adhesive bonding.
  - 2. Section 09 51 33 "Acoustical Metal Pan Ceilings" for ceilings consisting of metal-pan units with exposed and concealed suspension systems.
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Initial Selection: For components with factory-applied finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
  - 1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.
- E. Delegated-Design Submittal: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  1. Ceiling suspension-system members.
  2. Structural members to which suspension systems will be attached.
  3. Method of attaching hangers to building structure.
    - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
  5. Size and location of initial access modules for acoustical panels.
  6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    - a. Lighting fixtures.
    - b. Diffusers.
    - c. Grilles.
    - d. Speakers.
    - e. Sprinklers.
    - f. Access panels.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
  2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

## 1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  1. Build mockup of typical ceiling area as shown on Drawings.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

## 1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic restraints for ceiling systems.

- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Class A according to ASTM E1264.
  - 2. Smoke-Developed Index: 450 or less.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Indicate design designations from UL or from the listings of another qualified testing agency.

## 2.3 ACOUSTICAL PANELS (ACT-1) GENERAL

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  - 1. Basis of Design:
    - a. Armstrong Ceiling & Wall Solutions. Ultima 1911 HRC
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
  - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.89 LR.
- F. Ceiling Attenuation Class (CAC): Not less than 35 CAC.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70 NRC.
- H. Edge/Joint Detail: Tegular
- I. Thickness: 3/4 inch.
- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 ACOUSTICAL PANELS (ACT-2) KITCHEN & RECEIVING SUITE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Basis of Design:
    - a. Armstrong World Industries, Inc.; Kitchen Zone #673 (Basis of Design).
- B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E 1264.
- C. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- D. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
  - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
  - 2. Pattern: As indicated by manufacturer's designation..
- E. Color: White.
- F. Light Reflectance (LR): Not less than 0.89.
- G. Ceiling Attenuation Class (CAC): Not less than 0.30.
- H. Noise Reduction Coefficient (NRC): Not less than 0.85.
- I. Edge/Joint Detail: Tegular.
- J. Thickness: 3/4 inch.
- K. Modular Size: 24 by 24 inches.
- L. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.5 ACOUSTICAL PANELS (ACT-3)

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armstrong World Industries, Inc.; Ultima, 1910.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
  - 1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted with vinyl overlay on face, back, and sealed edges.
  - 2. Pattern: As indicated by manufacturer's designation.

- C. Color: White.
- D. LR: Not less than 0.89.
- E. NRC: Not less than 0.70.
- F. CAC: Not less than 35.
- G. Edge/Joint Detail: Square.
- H. Thickness: 3/4 inch.
- I. Modular Size: 24 by 24 inches.
- J. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

## 2.6 MANUFACTURERS (ACT-4)

### A. Formation Cloud Kits: (Basis of Design: Armstrong World Industries, Inc.)

1. The Following Components are included in the Armstrong Formation Cloud Kits:
  - a. Axiom Extruded Aluminum Trim, with factory-cut end details to form a cloud to the required size
  - b. Suspension system components are cut-to-length to provide for full-size installation
  - c. Aircraft Cable, cut to 10' length, in the amount required for the installation.
  - d. StrongBack™ carrying channel, cut-to-length to accommodate installation of the aircraft cable, 24" from the vertical face of the Axiom trim.
  - e. Axiom splices to join sections of Axiom.
  - f. Axiom Connector Clips to join suspension system components to the Axiom trim.
  - g. Axiom component diagram to properly position perimeter trim sections note: Pop-rivets, screws, and hardware required for attachment to the structure are not included.
  - h. Ceiling panels are ordered separately (refer to section 2.2.1 for details).
2. Kits contain all of the components required to construct and hang a complete cloud including the ceiling panels, the screws or pop-rivets needed to attach the clips to the grid members, and the hardware needed for attachment to the structure.
3. Formation Clouds available:
  - a. Circle Kit sizes: See Reflected Ceiling Plans for diameters
4. Colors: White
5. Wood Look Finishes: Light Cherry, Walnut, Oak, Barnwood Grey
6. Product/Manufacturer: Axiom Extruded Aluminum Custom Perimeter Trim; Armstrong World Industries, Inc.
  - a. Formations Standard Circles and Rounded Square Kits Axiom Profile in 2", 4" and 6" height

1) Vector

7. Components: The Axiom-Vector trim is to be installed inverted so the plane flat face is exposed when being used with Armstrong Lay-in and Tegular panels. Perimeter Edge Trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel 10-foot straight extruded lengths.

B. Acoustical Ceiling Units: (Basis of Design: Armstrong World Industries, Inc.)

1. Acoustical Panels Type ACT (Armstrong Ultima Panel Selection):

- a. Surface Texture: Fine
- b. Composition: Mineral Fiber
- c. Color: White
- d. Size: 24IN x 24IN
- e. Edge Profile: Tegular
- f. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, .75
- g. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
- h. Flame Spread: ASTM E 1264; Class A
- i. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.90
- j. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc.) must be complete and dry.
- k. Antimicrobial Protection
- l. Acceptable Product: Armstrong Ultima Tegular provided for use with Formation Kits as manufactured by Armstrong World Industries.

C. Acoustical Suspension System: (Basis of Design: Armstrong World Industries, Inc.)

1. Armstrong Prelude XL Selection

- a. Composition: Hot-dipped Galvanized Steel
- b. Color: White
- c. Profile Height: 1-11/16in
- d. Profile: PeakForm with SuperLock Main runner clip and XL<sup>2</sup> stake on end detail on Cross-tee
- e. Flange: 15/16"
- f. Acceptable Product: Prelude XL 15/16" Exposed Tee System provided with Formation Kits as manufactured by Armstrong World Industries.

2. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 IN type exposed flange design and or 9/16 IN Dimensional design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).

- a. Structural Classification: ASTM C 635 HD
- b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
4. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
6. Accessories

## 2.7 MANUFACTURERS (ACT-5)

### A. Formation Cloud Kits (Basis of Design: Armstrong World Industries, Inc.)

1. The Following Components are included in the Armstrong Formation Cloud Kits (Basis of Design):
  - a. Axiom Extruded Aluminum Trim, with factory-cut end details to form a cloud to the required size
  - b. Suspension system components are cut-to-length to provide for full-size installation
  - c. Aircraft Cable, cut to 10' length, in the amount required for the installation.
  - d. StrongBack™ carrying channel, cut-to-length to accommodate installation of the aircraft cable, 24" from the vertical face of the Axiom trim.
  - e. Axiom splices to join sections of Axiom.
  - f. Axiom Connector Clips to join suspension system components to the Axiom trim.
  - g. Axiom component diagram to properly position perimeter trim sections note: Pop-rivets, screws, and hardware required for attachment to the structure are not included.
  - h. Ceiling panels are ordered separately (refer to section 2.2.1 for details).
2. Kits contain all of the components required to construct and hang a complete cloud including the ceiling panels, the screws or pop-rivets needed to attach the clips to the grid members, and the hardware needed for attachment to the structure.
3. Formation Clouds available:
  - a. Circle Kits: 8'
4. Colors: White
5. Wood Look Finishes: Light Cherry, Walnut, Oak, Barnwood Grey
6. Product/Manufacturer: Axiom Extruded Aluminum Custom Perimeter Trim; Armstrong World Industries, Inc.
  - a. Formations Standard Circles and Rounded Square Kits Axiom Profile in 2", 4" and 6" height

#### 1) Vector



7. Components: The Axiom-Vector trim is to be installed inverted so the plane flat face is exposed when being used with Armstrong Lay-in and Tegular panels. Perimeter Edge Trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel 10-foot straight extruded lengths.

B. Acoustical Ceiling Units

1. Acoustical Panels Type ACT (Armstrong Ultima Panel Selection) (Basis of Design):
  - a. Surface Texture: Fine
  - b. Composition: Mineral Fiber
  - c. Color: Wood Look Finish: TBD
  - d. Size: 24IN x 24IN
  - e. Edge Profile: Square Lay-In
  - f. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, .70
  - g. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 38
  - h. Flame Spread: ASTM E 1264; Class A
  - i. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.90
  - j. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc.) must be complete and dry.
  - k. Antimicrobial Protection
  - l. Acceptable Product: Armstrong Ultima Health Zone Create provided for use with Formation Kits as manufactured by Armstrong World Industries.

C. Acoustical Suspension System

1. Armstrong Prelude XL Selection (Basis of Design)
  - a. Composition: Hot-dipped Galvanized Steel
  - b. Color: White
  - c. Profile Height: 1-11/16in
  - d. Profile: PeakForm with SuperLock Main runner clip and XL<sup>2</sup> stake on end detail on Cross-tee
  - e. Flange: 15/16"
  - f. Acceptable Product: Prelude XL 15/16" Exposed Tee System provided with Formation Kits as manufactured by Armstrong World Industries.
2. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 IN type exposed flange design and or 9/16 IN Dimensional design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
  - a. Structural Classification: ASTM C 635 HD

- b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
4. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
6. Accessories

## 2.8 MANUFACTURERS (ACT-6)

### A. Infusions Shapes

1. Surface Texture: Smooth
2. Composition: Polycarbonate
3. Color: TBD
4. Size: 48IN x 48IN
5. Edge Profile: Concept Suspension
6. Flame Spread: NFPA 286: Class A
7. Dimensional Stability: HumiGuard Plus
8. Acceptable Product: Infusions Shapes, Item # 7156\_\_\_ as manufactured by Armstrong World Industries (Basis of Design)

### B. Infusion Shapes

1. Surface Texture: Smooth
2. Composition: Polycarbonate
3. Color: TBD
4. Size: 48IN x 48IN
5. Edge Profile: Concept Suspension
6. Flame Spread: NFPA 286: Class A
7. Dimensional Stability: HumiGuard Plus
8. Acceptable Product: Infusions Shapes, Item # 7156\_\_\_ as manufactured by Armstrong World Industries (Basis of Design)

### C. Installation Hardware Kits: Armstrong World Industries, Inc. (Basis of Design)

### D. Attachment Systems:

1. Installation Hardware Kits
  - a. Standard kits include component requirements for various types of installations and are compatible with all canopy sizes. Refer to installation instructions regarding use of these components.

- 1) 7149 - Infusions Shapes 4 point hanger kit (Basis of Design)

## 2.9 MANUFACTURERS (ACT-7)

### A. Wood Ceiling Units: Armstrong World Industries, Inc. (Basis of Design)

#### 1. Ceiling Panels Type AP-1:

- a. Surface Texture: Smooth
- b. Composition: Solid Wood
- c. Finish: Grille White, Grille Maple, Grille Light Cherry, Grille Dark Cherry, Grille Walnut.
- d. Standard Sizes (Custom sizes available). See Reflected Ceiling Plans for sizes:
  - 1) 12" x 96" x 1-7/8" Backer or 12" x 96" x 1-3/8" Dowel Only
    - a) Item 7263, Slat width 5/8", Height 1-3/8", Slats Per panel 6, Slat spacing (nominal) 1-3/8"
    - b) Item 7264, Slat width 5/8", Height 1-3/8", Slats Per panel 8, Slat spacing (nominal) 7/8"
  - 2) 12" x 96" x 2-3/4" Backer or 12" x 96" x 2-1/4" Dowel Only
    - a) Item 7265, Slat width 5/8", Height 2-1/4", Slats Per panel 6, Slat spacing (nominal) 1-3/8"
    - b) Item 7266, Slat width 5/8", Height 2-1/4", Slats Per panel 8, Slat spacing (nominal) 7/8"
  - 3) 12" x 96" x 3-3/4" Backer or 12" x 96" x 3-1/4" Dowel Only
    - a) Item 7091, Slat width 5/8", Height 3-1/4", Slats Per panel 5, Slat spacing (nominal) 1-3/4"
    - b) Item 7092, Slat width 5/8", Height 3-1/4", Slats Per panel 6, Slat spacing (nominal) 1-3/8"
  - 4) 12" x 96" x 4-3/4" Backer or 12" x 96" x 4-1/4" Dowel Only
    - a) Item 7093, Slat width 5/8", Height 4-1/4", Slats Per panel 5, Slat spacing (nominal) 1-3/4"
  - 5) 12" x 96" x 2-3/4" Backer or 12" x 96" x 2-1/4" Dowel Only
    - a) Item 7094, Slat width 1", Height 2-1/4", Slats Per panel 4, Slat spacing (nominal) 2"
  - 6) 12" x 96" x 3-3/4" Backer or 12" x 96" x 3-1/4" Dowel Only
    - a) Item 7095, Slat width 1", Height 3-1/4", Slats Per panel 4, Slat spacing (nominal) 2"
  - 7) 12" x 96" x 4-3/4" Backer or 12" x 96" x 4-1/4" Dowel Only
    - a) Item 7096, Slat width 1", Height 4-1/4", Slats Per panel 4, Slat spacing (nominal) 2"
  - 8) 12" x 96" x 3-3/4" Backer or 12" x 96" x 3-1/4" Dowel Only
    - a) Item 7097, Slat width 1-1/4", Height 3-1/4", Slats Per panel 3, Slat spacing (nominal) 2-3/4"
  - 9) 12" x 96" x 4-3/4" Backer or 12" x 96" x 4-1/4" Dowel Only
    - a) Item 7098, Slat width 1-1/4", Height 4-1/4", Slats Per panel 3, Slat spacing (nominal) 2-3/4"
  - 10) 12" x 96" x 5-3/4" Backer or 12" x 96" x 5-1/4" Dowel Only
    - a) Item 7099, Slat width 1-1/4", Height 5-1/4", Slats Per panel 3, Slat spacing (nominal) 2-3/4".

- e. Noise Reduction Coefficient (NRC): ASTM C 423 WoodWorks Grille:
    - 1) With the addition of Infill Panel item 5823 – 0.85
    - 2) With the addition of Infill Panel item 6657 – 0.75
    - 3) With the addition of Infill Panel item 8200100 – 0.90
  - f. Flame Spread: Class A (HPVA)
  - g. Dimensional Stability: Standard
  - h. Acceptable Product: FSC certified WoodWorks Grille panels – items, 7263, 7264, 7265, 7266, 7091, 7092, 7093, 7094, 7095, 7096, 7097, 7098, 7099 as manufactured by Armstrong World Industries.
2. Accessories:
- a. Support Hanger item SH12
  - b. 5671 – Ledger item 5671
  - c. Junction - 1-3/8" item 5672
  - d. End Cap - 1-3/8" item 5674
  - e. End Cap - 2-1/4" item 5675
  - f. Backer Clip item 5687
  - g. Dowel Clip item 5688
  - h. BioAcoustic Infill Panel (Black - Matte) item 5823
  - i. Rigid Attachment Clip item 6459BL
  - j. BioAcoustic Infill Panel (Black - Matte) item 6657
  - k. WW Grille 3.25" End Cap item 7170
  - l. WW Grille 4.25" End Cap item 7171
  - m. WW Grille 5.25" End Cap item 7172
  - n. Radius Clip item RC2BL

B. Suspension Systems

- 1. Components: All Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
  - a. Structural Classification: ASTM C635 (Heavy Duty).
  - b. Color: Tech Black.
- 2. Acceptable Product: Prelude XL 15/16" Exposed Tee System as manufactured by Armstrong World Industries
- 3. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- 4. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least times-three design load, but not less than 12 gauge.
- 5. Accessories/Edge Moldings and Trim:
  - a. Solid Wood Trim 4" x 120" x 3/4" item 7146
  - b. Adjustable Trim Clip item 7239

2.10 MANUFACTURERS (ACT-8)

A. Formation Cloud Kits: Armstrong World Industries, Inc. (Basis of Design)

1. The Following Components are included in the Armstrong Formation Cloud Kits:
  - a. Axiom Extruded Aluminum Trim, with factory-cut end details to form a cloud to the required size
  - b. Suspension system components are cut-to-length to provide for full-size installation
  - c. Aircraft Cable, cut to 10' length, in the amount required for the installation.
  - d. StrongBack™ carrying channel, cut-to-length to accommodate installation of the aircraft cable, 24" from the vertical face of the Axiom trim.
  - e. Axiom splices to join sections of Axiom.
  - f. Axiom Connector Clips to join suspension system components to the Axiom trim.
  - g. Axiom component diagram to properly position perimeter trim sections note: Pop-rivets, screws, and hardware required for attachment to the structure are not included.
  - h. Ceiling panels are ordered separately (refer to section 2.2.1 for details).
2. Kits contain all of the components required to construct and hang a complete cloud including the ceiling panels, the screws or pop-rivets needed to attach the clips to the grid members, and the hardware needed for attachment to the structure.
3. Formation Clouds available:
  - a. Square and Rectangle Kit sizes: See Reflected Ceiling Plans for sizes
4. Colors: Effects Wood Look Finish TBD
5. Product/Manufacturer: Axiom Extruded Aluminum Custom Perimeter Trim; Armstrong World Industries, Inc.
  - a. Formations Square and Rectangles Kits Axiom Profiles in 2", 4" and 6" height
    - 1) Vector
    - 2) Knife Edge Tegalur
    - 3) Knife Edge Vector
6. Components: The Axiom-Vector trim is to be installed inverted so the plane flat face is exposed when being used with Armstrong Lay-in and Tegalur panels. Perimeter Edge Trim system for suspended ceiling system, extruded aluminum alloy 6063 trim channel 10-foot straight extruded lengths.

B. Acoustical Ceiling Units

1. Acoustical Panels Type ACT (Armstrong Metalworks)
  - a. Surface Texture: Fine
  - b. Composition: Steel
  - c. Color: Effects Wood Look finish TBD
  - d. Size: Size varies with Formation Kit selection
  - e. Edge Profile: (Square Tegalur) (Vector)

- f. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, .70 (perforated)
- g. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, N/A (perforated)
- h. Flame Spread: ASTM E 1264; Class A
- i. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.90
- j. Dimensional Stability: HumiGuard - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc.) must be complete and dry.
- k. Antimicrobial Protection
- l. Acceptable Product: Armstrong Metalworks (Square Tegular) (Vector) provided for use with Formation Kits as manufactured by Armstrong World Industries

C. Acoustical Suspension System

- 1. Armstrong Prelude XL Selection
  - a. Composition: Hot-dipped Galvanized Steel
  - b. Color: White
  - c. Profile Height: 1-11/16in
  - d. Profile: PeakForm with SuperLock Main runner clip and XL<sup>2</sup> stake on end detail on Cross-tee
  - e. Flange: 15/16"
  - f. Acceptable Product: Prelude XL 15/16" Exposed Tee System provided with Formation Kits as manufactured by Armstrong World Industries.
- 2. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 IN type exposed flange design and or 9/16 IN Dimensional design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
  - a. Structural Classification: ASTM C 635 HD
  - b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
- 3. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- 4. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
- 5. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- 6. Accessories

## 2.11 METAL SUSPENSION SYSTEM

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
  - 1. Basis of Design:
    - a. Armstrong Ceiling & Wall Solutions; Prelude XL 15/16" exposed Tee unless noted otherwise.
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
  - 1. Structural Classification: Intermediate-duty system.
  - 2. End Condition of Cross Runners: Override (stepped) type.
  - 3. Face Design: Flat, flush.
  - 4. Cap Material: Cold-rolled steel.
  - 5. Cap Finish: Painted white.

## 2.12 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
  - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Post-installed expansion anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
    - c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
    - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.
  - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
  - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  - 2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.

3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
  4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
  - D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
  - E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.
  - F. Hold-Down Clips: Manufacturer's standard hold-down.
  - G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
  - H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
  - I. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
  - J. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

## 2.13 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.



### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M and manufacturer's written instructions.
  - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  - 8. Do not attach hangers to steel deck tabs.
  - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
  - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
  - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  - 2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  - 3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
  - 4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  - 5. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
  - 6. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

### 3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
  - 1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
  - 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

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SECTION 114000

FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

- A. Provide all material, labor, equipment and services required to execute and complete all items of work relating to the food service equipment, both existing and new, all as required to make the resulting facility a fully functional and reliable operating unit in accordance with this Specification. All food service equipment shall be furnished as specified, delivered prepaid, unloaded and uncrated, assembled with all components and accessories connected within the equipment, set-in-place in proper location as indicated on the drawings, leveled and fastened to the wall, ceiling or floor as required, left ready for final utility connections. The work shall include:
  - 1. To prevent extended warehousing of all food service equipment, no pre-ordering of equipment is permitted; schedule ordering of the equipment so that warehousing of the equipment shall not be required for longer than 60 days prior to delivery to the site for installation.
  - 2. All food service equipment shall have a manufacturer extended warranty covering parts and labor for a period of two years which shall take effect only after acceptance and beneficial use by the District. All labor shall be performed by a factory authorized and qualified representative.
  - 3. A “complete and thorough” demonstration and start-up for each item of equipment must be conducted by a qualified manufacturer representative in the use, sanitation and maintenance of the equipment.
- B. Furnishing scheduled items of custom fabricated food service equipment as specified utilizing a food service equipment fabricator listed with the National Sanitation Foundation (NSF) for custom equipment fabrication.
- C. Delivery of food service equipment in factory fabricated containers designed to protect equipment and finish until final installation. Delivery of food service equipment shall be coordinated with the construction schedule. If necessary, delivery of the food service equipment shall be by means other than common carrier to expedite delivery and to maintain project schedule.
- D. Warehousing of the food service equipment in a bonded warehouse and re-delivery of the food service equipment from the storage facility to the project site or arrangement for secured storage

at the project site to assure availability of the food service equipment to maintain project schedule.

- E. Field installation of the food service equipment including buy out equipment at the project site including on site receiving and unloading, uncrating from packing containers, conveyance of the food service equipment from the receiving area to the installation location, erection and assembly of the food service equipment including field welding and polishing of sub assemblies and installation of fixtures and components and setting in place in final location.
- F. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and fire system propellant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- G. Removal and disposal of discontinued items of food service equipment not to be reused including costs for transport and scrapping. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- H. Removal, cleaning, servicing, reassemble and reinstallation of items of food service equipment to be reused including warehousing and transportation costs for scheduled items of food service equipment to be refurbished off-site or to be temporarily stored off-site. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of discontinued services and modification or preparation or relocated utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- I. Removal, cleaning, servicing, crating and delivery including costs for transport of items of food service equipment to be reused in an alternate location. This shall include pump-down and reclaim of refrigerant and disposal costs of all refrigeration systems as required. Utility disconnection and termination of utility services shall be provided by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- J. Removal and disposal of all packing material.
- K. All costs for special tools, crane rental or usage cost or rigging as may be required for delivery or installation of the food service equipment.
- L. All work is to be performed by skilled labor utilizing the proper Trades having respective jurisdiction thereto. All work shall be performed at hours required to maintain consistent work schedules with all other Trades without additional cost.
- M. Preparation of dimensioned utility rough-in floor plans coordinated with the Contract Documents and site conditions and the food service equipment manufacturers' utility connection points for all food service equipment.
- N. Assist in the preparation of "chalk-line" mark-up of utility rough-in locations on the building floor at the job site.

- O. Take complete financial responsibility for any and all additional expenses resulting from incomplete or inaccurate rough-in drawings or instructions for the final rough-in dimensioning at the job site.
- P. Provide complete manufacturers' and fabricator shop drawings of all related items of food service equipment.
- Q. Provide competent on site supervision for the coordination of work and to assist and supervise the erection, assembly and installation of the food service equipment, this shall include any moving, shifting or disassembly of the food service equipment to enable work to be performed free of obstruction.
- R. Attend all job conferences and meetings.
- S. Maintaining coordination and control over the form, fit, function and utility requirements of all food service equipment, from placement of purchase orders through Final Acceptance
- T. Provide competent on-site final testing, demonstration and instruction in the use and service of all items of food service equipment in the form of a qualified manufacturer's representative for each item of food service equipment.
- U. Providing access to the custom equipment fabricator's shop for inspection of construction and materials used at any time during the progress of fabrication.
- V. Field verification of all measurements at the project site prior to the fabrication of custom fabricated and buy-out equipment and correct any deviation from the dimensions indicated on any plans and shop drawing which may affect the final form or fit of any item of food service equipment as a result of final building conditions and actual field dimensions.
- W. All food service equipment shall conform to field verified dimensions and to the finished building conditions with edges scribed and sealed to wall surfaces, fitting to and around building obstructions. All joints, seams or surfaces shall be fully sealed with General Electric or equivalent clear silicone sealer.
- X. Field verification of delivery access into and through the building to the final equipment location including access and clearance through hallways, doorways and elevators (cab size and weight restrictions); furnish food service equipment in sections or sub-assemblies as required for access.
- Y. Keeping the premise free from accumulation of waste material and rubbish caused by his work. At the completion of each workday all waste material and rubbish must be removed and all areas swept broom clean.
- Z. Physical damage to equipment, building or previous work completed or in the process of completion shall be repaired or replaced.
- AA. Furnish as part of and affixed to the food service equipment, accessories, components and fixtures furnished standard with the equipment as specified or listed as an option and shall include the following:

1. PLUMBING ACCESSORIES: Pop-up, lever or basket type waste outlets, tailpieces, standing or connected overflows, faucets and spray units, vacuum breakers, shut-off and control valves and fittings.
  2. STEAM AND GAS ACCESSORIES: Steam supply valves, thermostats, pressure reducing and regulating valves, shut-off and control valves, temperature and pressure gauges, copper steam coils or injector assemblies, traps and fittings
  3. ELECTRICAL ACCESSORIES: Terminal blocks, conduit, wiring, signal and pilot lamps, on-off and control switches, control panels, magnetic contactor assemblies, heating elements, junction boxes, outlet boxes and receptacles and cord and plug sets.
  4. REFRIGERATION ACCESSORIES: Copper insulated refrigeration tubing, valves, fittings, hangers, high and low pressure control switches, solenoid valves, evaporator coils, expansion valves, condensing units and condensate evaporators.
- BB. All built-in accessories, components and fixtures shall be factory installed at the time of fabrication and shall comply with all applicable codes and regulations.
- CC. Furnish and install copper insulated refrigeration lines from compressor location to evaporator coils and expansion valves for all refrigeration units and ice makers with remote or refrigeration systems other than self-contained.
- DD. Furnish and install flexible stainless steel gas flue tubing from exhaust collar on gas hot water booster heater terminating at the exhaust vent connection at the vent extension or condensate hood.
- EE. Furnish 14 gauge galvanized steel welded roof curbs for all refrigeration condensing unit stands and exhaust fans and supply fan make-up air units including setting-in-place and securing to the building roof.
- FF. Furnish and install in exhaust hood, plenum, duct and surface fire protection system. Entire system shall be furnished and installed in compliance with UL Standard 1254, UL Standard 300, NFPA 96 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17A-27. The manufacturer of the fire suppression system shall be ISO 9001 registered. The entire installation must conform to ADA (American Disabilities Act) latest edition. The system shall be an automatic fire suppression system using a wet chemical agent for grease related fires. The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories (UL). The system shall be installed and serviced by certified personnel trained by the manufacturer. Provide as part of fire system, mechanically operated gas supply line shut-off valve to interrupt gas supply to all gas operated cooking appliances. Gas valve shall be provided with manual reset to prevent gas flow to pilot devices on appliances prior to restart.
- GG. Furnish and install remote and self-contained refrigeration system complete with Copeland condensing unit and insulated copper refrigeration lines charged with R404A refrigerant. Condensing unit shall be interconnected to a low profile, high velocity evaporator coil. Refrigeration system shall include all fittings, valves, switches, controls and all related components to comprise a complete operating unit of sufficient BTU capacity to maintain automatic operation of 35 degree F product temperature in coolers and -10 degree F product temperature in freezers. Refrigeration system provided with outdoor remote air cooled condensing unit shall be provided with winterized controls (low ambient package) including crankcase heater, line dryers and head pressure control unless specified as part



of a pre-assembled refrigeration rack system. Refrigeration lines to be run within any slab or floor shall be either hard copper or soft copper if run within conduit.

- HH. All electrical wiring, plumbing lines, gas lines (except exposed threaded pipe gas manifolds at cooking appliances), steam lines and refrigeration lines shall be concealed in the floor, walls or above the finished ceiling in an acceptable manner and in compliance with all applicable codes. Where it is impractical to run lines within the floor, walls or above the finished ceiling, lines shall be enclosed in a stainless steel (or alternate “smooth and cleanable” approved material) with appropriate access for service or replacement. In situations of an island arrangement or where equipment is not situated with access to a wall surface, lines must be installed in the floor in an approved manner including in-ground conduit for refrigeration and beverage lines. In no case shall any lines be “exposed”.
- II. Furnish materials and install all interconnecting wiring as required for the food service equipment, this shall include inter-wiring of control panels furnished as a part of a fixture or appliance, on-off switches for light fixtures furnished as a part of a fixture or appliance, inter-wiring of control devices to motors furnished as a part of a fixture or appliance, time clock circuits for freezers from remote condensing unit to evaporator coil, heated pressure relief ports in walk-in freezer, electrical receptacles furnished as a part of a fixture or appliance, light fixtures in exhaust hoods and walk-in refrigeration to on-off switches and conduit junction boxes, ceiling mounted heat lamps to remote wall switch and inter-wiring of food waste disposer from control device to disposer motor as required to complete the installation of the food service equipment.
- JJ. Furnish materials and install heat tracing tape to all condensate lines within walk-in freezer; insulate entire heat tracing tape with foam pipe insulation.
- KK. Furnish materials and install all interconnecting plumbing as required for the food service equipment, this shall include faucets, drains, drains with connected overflow, shut-off valves, vacuum breakers, flow or pressure control valves, gauges, bleeder tubes, piping from disposer control device to disposer cone and disposer body inlets and piping for steam operated equipment from boiler take-off valve at steam generator to steam inlet connection at appliance as required to complete the installation of the food service equipment.
- LL. Furnish materials and install insulated copper interconnecting piping between the dishmachine and the hot water booster heater, this shall include the installation of pressure and temperature gauges, strainer and shock absorber in the hot water supply line to the booster heater.
- MM. Furnish and install water filter assemblies, sized and of the proper type to accommodate the water flow rate and “particulate” requirement of the food service equipment; this shall include all combi and bake ovens, steam cookers, proofing cabinets, ice makers, coffee brewing equipment and soda and beverage dispensing equipment.
- NN. Furnish and install copper condensate lines in walk-in refrigeration from evaporator coil to waste receptor.
- OO. Furnish and install gas supply shut-off valve at each gas manifold connection and furnish and install flexible gas hose connectors to each shut-off valve and to each cooking appliance.
- PP. Furnish materials and install interconnecting chrome plated exposed piping for hose reel and hose bibs including installation of check valves and vacuum breaker in supply line; this shall

include chrome plated bleeder outlet if required by local health department regulations or local plumbing codes.

### 1.3 WORK BY THE ELECTRICAL TRADE

- A. Rough-in utility connections including proper voltage, phase and amperage required to satisfactorily operate all items of food service equipment.
- B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary connection points.
- C. All electrical components for the exhaust and supply ventilation system (including condensate hoods and pant leg vent systems) including, electrical disconnects, starters, exhaust fan on-off switch with indicator lights located in kitchen and supply fan controller with indicator lights located in kitchen and dishroom.
- D. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to, electrical circuit breakers or fuses, electrical receptacles, disconnect switches, on-off switches or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.
- E. Utility disconnection and termination of discontinued services of existing food service equipment to be terminated.
- F. Furnishing and installing electrical plug and cord sets where not furnished as part of the appliance.
- G. Electrical contractors or shunt-trip circuit breakers to interrupt electrical power to all electrically operated food service cooking appliances.
- H. In-floor, flush mounted, waterproof electrical receptacles of type and capacity to match plug and cord sets for all mobile food service counter equipment.
- I. Ceiling mounted, retractable drop cords to accommodate food service equipment in an island arrangement, of the type and capacity to match plug and cord sets of the food service appliances.
- J. Furnishing materials and installation of all interconnecting wiring as required for the food service exhaust ventilation and fire suppression systems; this shall include wiring of electrically operated gas supply shut-off valves for fire suppression systems, fire suppression system wiring to building fire alarm, heat detector electrical detection device to automatically start supply and exhaust fans and exhaust hood light fixtures to remote wall switch.

### 1.4 WORK BY THE PLUMBING TRADE

- A. Rough-in utility connections including gas, steam, hot and cold water and floor receptors and drains in proper sizes, pressures and quantities required to satisfactorily operate all items of food service equipment.

- B. Final connection of the food service equipment from the rough-in location to the connection point on all food service equipment and necessary outlets.
- C. Furnishing and installation of all accessories, components and fixtures other than those specified as part of the food service equipment, to include but not be limited to stop cocks, traps, pipe, shut-off valves, pressure reducing valves or other fittings and appurtenances that are required to connect the food service equipment in accordance with manufacturer's instructions and result in proper operation.
- D. Furnish materials and install insulated copper interconnecting piping between the dishmachine and the hot water booster heater, this shall include the installation of pressure and temperature gauges, strainer and shock absorber in the hot water supply line to the booster heater.
- E. Furnishing and installing chrome plated indirect waste outlet piping for food service equipment, from the waste outlet connection on the food service equipment to the building waste receptacle (floor sink, etc.).
- F. Flushing and sanitizing of lines before making final connections to the food service equipment.
- G. Grease interceptors for food service equipment in capacity and size as required by code.
- H. Furnish and install exposed threaded gas manifold piping for all cooking appliances and welded in-wall gas manifold piping.
- I. Install gas shut-off valve supplied as part of the fire suppression system in the gas supply line in an exposed and accessible location.

#### 1.5 WORK BY THE MECHANICAL TRADE

- A. Supply and exhaust ventilation for indoor refrigeration condensing units based on 750 cfm for each air cooled compressor horsepower and 250 cfm for each water cooled compressor horsepower.
- B. Exhaust ventilation for condensate applications including fully welded 18 gauge stainless steel or 12 gauge aluminum liquid tight ductwork pitched toward source to prevent leaking, fan and start-stop switch with indicator lights located in the dishroom.
- C. Exhaust hood exhaust ventilation system including roof top mounted "utility set" type up-blast centrifugal fan with backward incline wheel, adjustable sheaves, vibration mounts and bird screen at discharge end; fan shall be rated at 14 sones or less and shall be UL 710 listed; roof curb, exhaust ductwork constructed of a minimum 16 gauge galvanized steel or 18 gauge stainless steel, fully welded liquid tight with clean-outs at every major bend and in 20 foot intervals; ductwork shall not exceed a three to one aspect ratio, connection to exhaust fan shall include a UL listed and rated vibration eliminator and ductwork shall be insulated with all prevailing codes.
- D. Exhaust hood supply ventilation system including roof top mounted UL listed supply fan with vibration mounts, adjustable sheaves, roof curb, bird screen at intake end, maintainable filtration system, and gas or electric heated supply air heater (supply air heater heat incoming supply air below a 65 degree F ambient temperature) and 22 gauge galvanized steel ductwork.

- E. Disconnection and termination of discontinued ductwork of existing exhaust or condensate hoods to be terminated or relocated, and modification or preparation of exhaust system for existing exhaust or condensate hoods to be relocated at the new location.

#### 1.6 WORK BY THE CONSTRUCTION TRADE

- A. Masonry bases, floor curbs, structural pads, floor depressions, roof curbs, flues and fireproof duct shafts or enclosures.
- B. Conduit for beverage lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends and 24" x 24" pull boxes every 100 lineal feet or three turns including sleeves any through walls, floors and ceilings.
- C. Sleeves and openings through wall, floors and ceilings for passage of refrigeration lines.
- D. Wall blocking or reinforcing to adequately support wall mounted food service equipment or fixtures; provide 3/4" thick exterior grade plywood backing for wood stud applications and 16 gauge steel backing for metal stud applications.
- E. Stainless steel or FPR wall paneling behind all mop receptors, dishtables and pot / utensil washing sinks.
- F. Installation of floor pans in floor depression with floor pans set flush and finished watertight around entire perimeter at juncture with floor surface.
- G. Conduit for refrigeration lines (PVC if embedded in concrete or smooth aluminum if exposed) with 24" radius sweep bends including sleeves any through walls, floors and ceiling.

#### 1.7 WORK BY THE ROOFING TRADE

- A. Roof penetrations properly sealed and flashed to prevent water penetration.

#### 1.8 BIDDING INSTRUCTIONS AND QUALIFICATION OF BIDDER

- A. Items of food service equipment described in this specification are considered the basis of the bid. Only "equal" items listed as part of this specification will be considered and must meet the conditions of the base bid item; this shall include all materials and material finishes, fabrication methods, electrical, plumbing, and mechanical components, electrical control devices, hardware, accessories and options, exactly as specified without exception. It will be the full and complete responsibility of the Food Service Equipment Contractor to pay any and all costs incurred in adapting any other "equal" item to the mechanical, electrical, exhaust ventilation or structural systems of the building including any other cost increase incurred as a result of engineering changes to the mechanical, electrical, exhaust ventilation, architectural, structural or food service drawings. The contract is to be awarded as follows:
  - 1. The competence and responsibility of the bidder.
  - 2. An itemized cost breakdown of each scheduled item of food service equipment is required, as specified in order that the District may, at his option, delete any item or

- supply any portion thereof or increase the quantity of any item without affecting the cost quoted for the remaining items. "Pre-approved "substituted items must be submitted as an add or deduct alternate in addition to the base bid
3. The District is not obligated to accept the lowest or any other bid. The award of the contract shall be at the Districts discretion.
- B. Each bidder shall be responsible to visit the project site of the proposed work and fully acquaint himself with conditions as they exist.
- C. Each bidder is responsible to attend any pre-bid meeting as required by the District.
- D. Each bidder shall be responsible to examine and review the contract document drawings and specifications. Should the bidder find during examination of the drawings and specifications any discrepancies, omissions, ambiguities or conflicts in or among the contract documents or shall be in doubt as to their meaning, the District shall be notified no later than four working days prior to bid opening for clarification.
- E. The failure or omission by any bidder to receive or examine any form, instrument, or document or to visit the project site shall in no way relieve him from obligation with respect to his bid. No claims for any extras will be allowed due to unintentional errors, conflicts or omissions in the contract documents drawings or specifications

#### 1.9 SUBMITTALS

- A. Product Data: For each buy-out item of food service equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel and service connections including roughing-in dimensions
- B. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Shop drawings shall include the following information:
1. Dimensioned rough-in plans scaled at 1/4"=1'-0" accurately locating connection points and indicating utility data for all mechanical, electrical and supply and exhaust ventilation requirements.
  2. Dimensioned plans scaled at 1/2"=1'-0" accurately locating and indicating the finished size of masonry bases, floor depressions in structural slabs, stub walls, curbs and finished openings for pass-thru equipment.
  3. Dimensioned plans scaled at 1/4"=1'-0" accurately locating conduit and pull boxes for beverage and refrigeration lines including floor, wall and ceiling penetrations and termination points.
  4. Dimensioned plans and detailed drawings of all custom fabricated food service equipment scaled at 3/4"=1'-0" for plan and elevation views and 1-1/2"=1'-0" for sectional views.
- C. Copies of original maintenance and repair manuals including a list of all authorized service agencies responsible for each item of food service equipment.

1.10 QUALITY ASSURANCE

- A. Manufacturer's qualifications shall include a firm that has regularly engaged in the manufacturing of food service equipment of the same type, capacity, performance and size as specified and whose products have been in similar service for not less than five years.
- B. Custom fabricator qualifications for custom food service equipment shall include a skilled sheet metal shop with a minimum of five years' experience in custom sheet metal food service equipment fabrication of similar type as specified. All custom food service equipment shall be fabricated at the same shop.
- C. Installer's qualifications shall include a firm with at least three years of successful installation experience on projects with a similar scope to that as required for this project.
- D. Food service equipment dealers' qualifications shall include a firm which is regularly engaged in the purchasing of food service equipment as is a manufacturer authorized agent of the specified equipment for not less than five years. The dealer shall also employ a full time project management staff to oversee the purchase of the equipment in compliance with the specifications, coordinate the form and fit of the equipment to the project site conditions, attend all project meetings, coordinate shop drawing review, coordinate installation with the Trades, coordinate factory training and address all issues as they relate to the satisfactory completion of the facility in compliance with the specifications and related documentation.
- E. Codes and Standards: All food service equipment furnished and installed under this specification shall be manufactured in strict compliance with the following publications or the current or revised related publication as well as all state, national and local codes and agencies having jurisdiction over same:
  - 1. National Electrical Manufacturer Association NEMA
    - a. ICS-77 Industrial Controls and Systems
  - 2. National Electrical Manufacturer Association NEMA
    - a. ICS-77 Industrial Controls and Systems
    - b. 17.4 Local Application System
    - c. 17.13 Water Sprinkler Systems
    - d. 96-76 Installation of Equipment for the Removal of Smoke and Grease Laden Vapors for Commercial Cooking Equipment
  - 3. National Sanitation Foundation NSF
    - a. 11 76 Food Service Equipment
    - b. 4 73 Commercial Cooking and Warming Equipment
    - c. C-2-72 Special Equipment and/or Devices
  - 4. National Electrical Manufacturer Association NEMA
    - a. 57-78 Electric Lighting Fixtures
    - b. 197-78 Commercial Electric Cooking Appliances
    - c. 300 Fire Extinguishing Systems
- F. All food service equipment shall be manufactured in strict compliance with standards as set forth by the National Sanitation Foundation (NSF) including fabrication of custom built equipment and shall be listed with same and shall bear their seal. Any item of food service equipment lacking the NSF seal will be rejected.

- G. All electrically operated food service equipment shall be constructed in strict compliance with standards as set forth by the Underwriters Laboratories (UL) and shall utilize approved components and assemblies and shall bear the label thereof.
- H. Custom fabricated food service equipment shall be constructed to the standards as set forth by the National Association of Food Equipment Manufacturers (NAFEM).
- I. All refrigeration equipment and all pressurized vessels shall be constructed, approved, inspected, registered and stamped and installed in strict compliance with the American Society of Mechanical Engineers (ASME), state and local codes for Unfired Pressure Vessels and all other agencies having jurisdiction thereof.
- J. All gas operated food service equipment shall be fabricated in strict compliance with standards as set forth by the Underwriter Laboratory (UL) and shall be listed with same and shall bear their seal.
- K. Steam operated equipment shall be fabricated and installed in accordance with Pennsylvania Department of Labor and Industry standards.
- L. Product Options: Drawings indicate food service equipment based on the specific products indicated. Other manufacturers' equipment with equivalent size and performance characteristics may be considered.
- M. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to the following:
  - 1. Review access requirements for equipment delivery.
  - 2. Review equipment storage and security requirements.
  - 3. Inspect and discuss condition of substrate and other preparatory work performed by other Trades.
  - 4. Review structural loading limitations.
  - 5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

#### 1.11 DELIVERY, STORAGE AND HANDLING

- A. Deliver food service equipment as factory-assembled units with protective crating and covering.
- B. Store food service equipment in original protective crating and covering and in a dry location.

#### 1.12 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.13 COORDINATION

- A. Coordinate equipment layout and installation with other work including light fixtures, HVAC equipment and fire-suppression system components.
- B. Coordinate location and requirements of service-utility connections.
- C. Coordinate size, location and requirements of concrete bases, positive slopes to drains, floor depressions and insulated floors. Concrete, reinforcement and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete".
- D. Coordinate installation of roof curbs, equipment supports and roof penetrations, as specified in Division 7 Section "Roof Accessories".

1.14 WARRANTIES

- A. General Warranty: The special warranty specified in this Article shall not deprive the District of other rights the District may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. All buy-out food service equipment herein specified shall have all parts and labor warranted in writing, from the date of Final Acceptance by the District against defective parts, materials, workmanship and design for a period of time as stated within the manufacturers standard published warranty, but no less than two years.
- C. All custom fabricated food service equipment shall be warranted as stated above except for a period of two years.
- D. Refrigeration equipment shall include start-up and two year parts and labor warranty on the entire refrigeration system and manufacturers five year parts warranty on hermetic scroll and semi-hermetic sealed compressors.
- E. Existing equipment refurbished for reuse shall be warranted in writing, against defective parts, materials and labor as stated above but for a period of 90 days.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. Stainless steel shall be type 302 or type 304 extra low carbon non-magnetic austenitic 18% chrome, 8% nickel alloy steel. Gauges shall be U.S. Standard of Thickness set forth below:

GAUGE	THICKNESS	GAUGE	THICKNESS
10	.1346	16	.0598
11	.1196	18	.0478



12	.1046	20	.0359
14	.0747	22	.0299

- B. All sheets shall be of maximum length to permit fabrication from one sheet. All thickness must meet the above gauge thickness within tolerances set forth by the ANSI after polishing. Finished sheets exceeding these tolerances shall be rejected as not meeting this Specification.
- C. Galvaneal steel shall be ARMCO steel or an approved grade of copper bearing steel shall be properly primed, degreased and finished with two coats of synthetic aluminum bronze.
- D. Structural steel members used for framing, consisting of angles, bands, bars and channels shall be ductile in quality, free of hard spots, runs, checks, cracks and other surface defects and shall be smooth galvanized by the hot dip process with all surplus removed, free of runs, blisters, excess splatter and uncoated spots or patches.
- E. White metal shall consist of corrosion resistant metal containing not less than 21% nickel. All castings shall be rough ground, polished and buffed to a bright luster and shall be free from pit marks, runs, checks, burrs and other imperfections.
- F. Stainless steel pipe and tubing shall be seamless or welded of gauge specified and of true roundness. Seamless tubing shall be thoroughly and correctly annealed and ground smooth. Welded tubing shall be thoroughly heat treated and properly quenched to eliminate carbide precipitation, drawn true to size and roundness and polished to match stainless steel sheets.
- G. Welding shall be of the electric submerged or concealed arc type, heliarc wherever practical. Where welding rods are required they shall be of the same composition as materials to be joined coated with a non-carbonaceous flux.
- H. Plastic Laminate: Complying with NEMA LD 3 and NSF 35 requirements; NSF certified for end-use application indicated; 0.050 inch (1.27 mm) thick, smooth texture and easily cleanable.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
- I. Plywood and Lumber: Close grain exterior grade mahogany or birch plywood.
- J. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that when cured and washed meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.
  - 1. Color: As selected by Architect from manufacturer's full range of colors.
  - 2. Backer Rod: Closed-cell polyethylene in diameter larger than joint width.
- K. Plastic: Except for plastic laminate, provide plastic materials and components complying with NSF 51.
- L. Sound Dampening: NSF-certified, non-absorbent, hard drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8-inch (3-mm) thickness that does not chip, flake or blister.

- M. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene or PVC that is nontoxic, stable, odorless, nonabsorbent and unaffected by exposure to foods and cleaning compounds.

## 2.2 ACCESSORIES

- A. Cabinet Hardware: Provide NSF-certified stainless steel hardware for equipment items as indicated.
- B. Casters: NSF-certified standard-duty stainless-steel swivel stem casters with 5-inch (125-mm) diameter wheels, polyurethane tires with 1-inch (25-mm) tread width and 300-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

## 2.3 FABRICATION, GENERAL

- A. All welds shall be strong and ductile, nonporous, free of pits and cracks. Parts which are to be welded shall be homogeneous, of a like color and finish to adjoining material. Excess metal and carbide precipitation shall be ground off, finished smooth and polished. Unexposed welds shall be pacified to prevent attrition. Brazed or soldered joints are unacceptable. Where galvanizing has been damaged due to the welding or grinding process, these areas shall be galvawelded to replace finish
- B. All exposed surfaces of the food service equipment shall be free from bolts, screws and rivet fastenings. Wherever bolts are required they shall be of similar composition and finish as the metal to which they are applied.
- C. Wherever practical all food service equipment and fixtures shall be factory or shop fabricated of one-piece construction, shipped to the project site as one unit completely assembled.
- D. Items of food service equipment or fixtures too large to enter or transverse the building to the installation location in one assembly shall be constructed in sections and shall be furnished with field joints. Where field joints are necessary, all adjoining exposed surfaces shall be field welded at the project site as specified above for welding. Where conditions make welded field joints impractical, each sub-assembly shall be fabricated with off-set draw angles welded to the underside of each adjoining top surface and drawn together to a "hairline" seam with 1/4"-20 stainless steel bolts with lock washers and chrome plated acorn nuts. Bolted field joints will be permitted only where specifically shown on Drawings or specified for a particular item.
- E. Wherever shear edges occur they shall be free of burrs, fins or irregular projections and shall be finished to prevent cutting or laceration when the hand is drawn over such shear edges. Brake bends shall be free of undue and where such bends do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing and finishing. In no case where miters or bullnose corners occur is overlapping materials acceptable.

## 2.4 GENERAL FRABRICATION STANDARDS

- A. TOPS:

1. Tops shall be fabricated of 14 gauge stainless steel unless otherwise specified. All edges shall be bullnose or formed as specified with all joints butt-edged and electrically welded, ground smooth and polished so no evidence of welding will appear. Soldered corners to achieve round corner construction will not be accepted.
2. Tops adjacent to walls, columns or other equipment shall be turned up integrally into a backsplash as specified. All interior corners shall be coved on a  $\frac{3}{4}$ " radius, both horizontally and vertically, forming spherical corners. Ends of backsplashes shall be fully enclosed to the low point of the top edge, fully welded, ground smooth and polished.

**B. SUPPORT FRAMING**

1. Around the entire perimeter on the underside of all tops and set back 1" from the down-turned edge shall be a fully welded frame assembly fabricated of 1-1/2" x 1-1/2" x 1/8" stainless steel angle iron or material as specified. Provide intermediate cross bracing fabricated of the same material as the angle framing and fully weld to perimeter frame on centers not to exceed 24". Tack weld the entire frame assembly to the underside of the top surface.
2. Open base tables shall be provided with leg mounting channels for weld anchoring leg gussets and shall be fabricated of 1" x 4" x 1" 12 gauge stainless steel or material as specified fully welded at each end of frame and at intervals not to exceed 6'-0".
3. Cabinet base tables and counters shall be provided with triangular corner gusset plates for weld anchoring counter type legs and shall be fabricated of 12 gauge stainless steel fully welded at each corner of table or counter body and at intervals not to exceed 6'-0".
4. Freestanding sinks and Bain Maries shall be provided with triangular corner gusset plates for weld anchoring leg gussets and shall be fabricated of 12 gauge stainless steel, fully welded at each corner of sink or Bain Marie bottom and at intervals not to exceed 6'-0".

**C. LEGS AND ADJUSTABLE BULLET FEET**

1. Legs shall be constructed of 1-5/8" diameter 16 gauge stainless steel tubing. Each leg shall be swaged and tapered at the bottom. Fasten each leg to a 3-1/2" high conical shaped die-formed stainless steel gusset equivalent to Component Hardware A20-0206. Provide each leg with stainless steel adjustable foot insert equivalent to Component Hardware A10-0852.
2. Cabinet base tables and counters shall be provided with 6" high conical shaped die-formed stainless steel equipment leg with stainless steel adjustable round foot insert equivalent to Component Hardware A72-0811.

**D. CROSSRAILS**

1. Provide all open base tables and freestanding sinks and bain Maries with 1-1/4" diameter 16 gauge stainless steel tubular cross railing running between legs at a point 10" above the finished floor. Cross railing shall be continuously welded to legs, filleted, ground smooth and polished to provide a smooth coved radius with leg surface.
2. Where cross railing abuts cabinet base fixtures, cross railing shall be concealed bolt anchored to same utilizing stainless steel hardware.

**E. UNDERSHELVES**

1. Provide solid fixed undershelf, constructed of 16 gauge stainless steel. Front edge shall be turned down 1" at 90 degrees and returned 1/2" at 45 degrees. Rear and ends shall be turned up 2" high on a 90 degree angle, interior corners coved on 3/4" radius.

F. DRAWERS

1. Provide drawer pan constructed of 14 gauge stainless steel with inside corners coved on a 3/4" radius. Drawer front face shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Drawer front shall be set into and shall be removable from a 14 gauge stainless steel, channel shaped drawer cradle. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14 gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Drawer suspension guides shall be fastened to 18 gauge stainless steel housing which is suspended from the angle framing under the table top. Provide drawer fronts with full grip recessed stainless steel flush pull handles.
2. Stainless steel drawer enclosure cabinet with quantity of drawers as specified with cabinet body fabricated of 18 gauge stainless steel, wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18 gauge stainless steel, welded in place, and closed on top and bottom. Drawer suspension slides shall be secured to drawer frame assembly and shall be Component Hardware S52 series full extension type with 14 gauge stainless steel slides with stainless steel ball bearing wheels having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Provide drawer fronts with full grip recessed stainless steel flush pull handles.

G. CABINET BASES

1. Cabinet body shall be fabricated of 18 gauge stainless steel wrap around construction. The backs of front stiles shall be closed with tight fitting channel sections of 18 gauge stainless steel, welded in place and closed on top and bottom.
2. Cabinet base shelves shall be fixed bottom and intermediate fabricated of 18 gauge stainless steel. Front edge shall be turned down 1 1/2" at 90 degrees, returned 1/2" at 90 degrees. Rear and ends shall be turned up 2" at 90 degrees with interior corners coved on a 3/4" radius. Shelf shall be weld anchored to cabinet body. Bottom shelf shall be fabricated flush with front mullions with fully welded facing junctures presenting seamless construction. Fixed intermediate shelves shall be designed similar to bottom shelf except front edge shall be set behind vertical mullions and fully welded thereto.

H. SLIDING DOORS

1. Sliding doors shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Doors shall have welded internally 1" x 4" x 1/4" 14 gauge stainless steel hat type reinforcing channels. Doors shall be fitted with full grip, recessed type stainless steel flush pull handles. Provide 16 gauge stainless steel angle door stops welded to door. Provide hard rubber door stops. Provide each door with two, 1 3/8" diameter stainless steel ball bearing sheaves fastened to 1" x 1/8" thick stainless steel bar stock hangers welded to top corners of each door for suspending on overhead door channel track. Provide hangers with stainless steel removable locks to prevent doors from jumping track during operation while permitting ease of removal. Fabricate overhead track of 14 gauge stainless steel and weld to cabinet body. Provide

bottom of doors with nylon door guides secured to bottom shelf. Guides shall not interfere with door removal.

I. HINGED DOORS

1. Hinged doors shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Hinges shall be stainless steel cam action pin type fastened by means of counter sunk flat head stainless steel screws staggered on centers and tapped into 1/4" thick stainless steel bar stock welded behind door jamb. Doors shall be removable from hinges without the use of tools. Doors shall be held closed by permanent magnet closure devices. Doors shall be fitted with a full grip recessed type stainless steel flush pull handles. Provide hard rubber door stop bumpers.

J. SINKS

1. Sinks shall be fabricated of 14 gauge stainless steel with all interior corners coved on a 3/4" radius both horizontally and vertically forming spherical corners.
2. Exposed edges of sink shall be finished with a 1 1/2" diameter 180 degree rolled edge, rear and sides adjacent to adjoining surfaces shall have a backsplash turned up 10" high at a 90 degree angle on a 3/4" radius and turned back 2 1/2" on a 45 degree angle, then down 1/2" at 90 degrees along back.
3. Multiple sink compartments shall be divided with double wall 14 gauge stainless steel partitions 1" wide rounded on top and all corners at a 3/4" radius. Finish bottom, back and front with 14 gauge stainless steel to form one continuous sink with no overlapping joints or open spaces between sink compartments.
4. Integral drainboards shall be constructed of 14 gauge stainless steel. The front portion shall continue the 1 1/2" diameter 180 degree rolled rim of the sink bowl on a continuous level horizontal plane. The surface of the drainboard shall be pitched from 2 1/2" at the end away from the sink to 3" at the sink bowl. Sink and drainboard backsplash shall be continuous and level on the horizontal plane. All interior corners both vertical and horizontal shall be coved on a 3/4" radius. Drainboards shall be reinforced with 1" x 4" x 1", 12 gauge stainless steel "hat" channels extending front to rear tack welded to underside of drainboard for weld anchoring leg gussets.
5. Provide crossrails extending front to rear between legs, crossrails shall not extend along rear at sink to prevent interference with plumbing.
6. Built-in sink compartments shall be fabricated as an integral part of fixture with sink fully welded with adjacent top, weld ground smooth and polished.

K. MILLWORK

1. Millwork fabricator shop shall be a certified participant in AWI's Quality Certification Program (QCP) to standard "Premium" construction.
2. Tops shall be fabricated of 3/4" thick 5-7 ply BW marine grade plywood build up to a 1 1/2" thickness. All plastic laminate finished edges shall be applied prior to the surface laminate. Provide cross bracing around entire perimeter below tops and above all interior dividers to minimize deflection from equipment. Tops shall be fabricated in sections as large as possible to minimize field seams. Field seams shall be assembled utilizing TB-2 yellow glue. The bottom surfaces of all tops must be sealed with gray cabinet liner to comply with Board of Health requirements. Cut-outs for drop-in equipment shall be cut in the shop and with all edges sealed. All drop-in equipment shall be pre-fitted in top prior to delivery to the job site. All drop-in equipment shall be sealed with General

Electric or equivalent clear silicon sealer after installation. Hardwood edges shall be applied prior to surface laminate. All hardwood to match for color and grain. Edges to be chamfered and finished as specified. Solid surface tops shall receive full plywood substrate with 3/4" x 3" batons for proper air space. All tops shall be prepared for installation of sneeze guards including additional blocking and / or cutouts.

3. All cabinet base and interiors shall be fabricated of 3/4" thick 5-7 ply marine grade plywood with high-pressure laminate finish. Recessed toe base shall be 6" high fabricated of 3/4" thick 5-7 ply marine grade plywood with 16 gauge stainless steel finish. Shelf pilasters to be recessed type 250WH with 253WH locking clips. Cabinet backs shall be fabricated of 1/4" thick MELA-MDF board. Cabinet ends to be dadoed for back and bottom and notched to receive aprons and kicks. Butt or dowel construction will not be acceptable. Cabinets shall be assembled with TB-2 yellow glue with screws and staples. Cabinets with finished backs shall be fabricated of 3/4" thick 5-7 marine grade plywood with high-pressure laminate finish. Cabinets over 48" in length shall have interior dividers. Dividers shall be dadoed into the bottom and notched for aprons. Dividers shall be notched as required for equipment. Aprons shall be large enough to conceal drop-in equipment and also to house control panels. Cabinet bases shall be fabricated in sections as large as possible to minimize field seams.
4. Doors shall be fabricated of 3/4" thick MDF board with high-pressure laminate finish and shall be furnished with three BLUM 75M5580 or 75M5680 European style concealed hinges. Door pulls shall be Hafele 116.39.437. Locks where required shall be cam style, keyed alike. Doors shall not exceed 27" in width and shall be of equal size.
5. Drawers shall be constructed of 3/8" thick birchwood with dove tail joinery. Drawer slides shall be Accuride 150 lb. full extension type with stainless steel ball bearing hardware.
6. Applied wood fascia panels and doors shall be stile and rail design. Panels to be recessed or raised as specified. All wood to be select for color and grain. Finish shall match stock color samples or custom to match furnished sample. All panels and doors to be equally sized per cabinet. Provide full wood louvered panels as required for equipment requiring air circulation. Finish all wood with stain followed by single coat of sealer. After sealer, apply one layer of Armourcote conversion varnish approved for use in food service with 55% gloss.

L. SOLID AND HARD SURFACE MATERIAL ("CORIAN" / "ZODIAK")

1. Provide counter top, tray slide, etc. of approved solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated on the food service and architectural detail drawings, routed and finished as directed. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a 3/4" thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material

M. PAINTING

1. Galvanized steel shall be cleaned and degreased with mineral spirits, primed with a minimum of two coats of primer and spray finished with a minimum of two coats of gray epoxy enamel paint

N. LAMINATED PLASTIC

1. All exposed surfaces shall be faced with 1/16" thick high pressure plastic laminate in color and pattern as specified.
2. All unexposed surfaces shall be faced with .020 or .030 gray thermoset decorative overlay.
3. Where the plastic laminate is to be bonded to removable or fixed panels the panels shall be fabricated of 3/4" thick close grain marine grade mahogany or birch plywood with surfaces bonded with waterproof glue.
4. Where the plastic laminate is to be bonded directly to the metal facing of a cabinet base table or counter, surfaces shall be bonded with contact adhesive.

O. CLOSURE TRIM

1. Provide closure trim pieces fabricated of 16 gauge stainless steel or of material and finish as specified, trim shall be one piece constructions furnished to seal both horizontal and vertical junctures and openings

2.5 STAINLESS STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal products" for recommendations relative to applying and designating finishes.
  1. Remove or blend tool and die marks and stretch lines into finish.
  2. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Concealed Surfaces: Minimum of 80 grit finish.
- C. Exposed Surfaces: No. 4 finish (bright, directional polish) of 180 grit.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable temporary protective covering before shipment.

2.6 STANDARDS FOR EXISTING EQUIPMENT

- A. The food service equipment contractor shall examine each item of food service equipment specified as existing to be reused prior to his submission of his bid to ascertain proper fit and alignment in its proposed location, inspect for any physical damage and to determine the present operational performance and condition of each item or any component thereof and submit to the Owner as part of his bid the extent of repairs or replacement parts, required to recondition the entire unit for satisfactory operation.

- B. The food service equipment contractor shall disassemble each existing item to be reused, clean, service and recondition including any transport for reconditioning if required at any service agency or shop, redeliver or relocate at the project site to the new location, set-in-place, align and secure in its new location and assemble any fixtures, components and sub-assemblies, left ready for final utility connections by the Trades.
1. Cleaning of the food service equipment shall include a thorough scrapping and steam cleaning to remove scale and all foreign material.
  2. Repainting of all fabricated and buy-out items having worn or scarred exposed surfaces that are not stainless steel materials. Repainting shall be a minimum of two coats of original paint or touched-up as required.
  3. Repair any damage incurred during relocation or transit such as dents, cracks or broken welds.
  4. Replacement of door gaskets and seals and realignment for proper operation.
  5. Replace non-functioning condensate evaporators in refrigerators.
  6. Replacement of broken door hinges, drawer slide assemblies, door and drawer handles, door pans or lock assemblies.
  7. Servicing and cleaning of all condensing units, (vacuum and comb), evaporator coils, expansion valves, etc. setting and adjusting of all temperature controls to maintain normal operating temperature and charging of the refrigeration system with proper refrigerant. Refrigeration systems to be re-used shall be recharged with proper refrigerant or converted to an acceptable code compliant refrigerant.
  8. Replace or repair all plumbing components as required including faucets and waste outlets with fixtures of similar type and manufacturer.
  9. Pump-down of all refrigeration systems to be discontinued or relocated and re-claiming and disposal of all refrigerant and toxic materials as necessary.
- C. The following work shall be included as part of this contract on specified items or as required by the Owner or as determined or recommended as necessary during the site inspection.
1. Repair or replacement of all materials or parts to correct any gas, steam or electrically operated cooking appliance including power generation devices such as boilers and related mechanical and electrical heating and control components and devices.
  2. Remove, sharpen and reinstall all cutting blades on all cutting machinery including slicers, food cutters and food choppers.
  3. Recondition and lubricate electric motors and transmission devices, replacing worn or damaged gears, drive belts, etc. and repacking or replacing oil with proper type as recommended by the manufacturer.
  4. Inspecting, cleaning and upgrading of exhaust ventilation systems including fire protection systems and components. Exhaust hood shall be steam cleaned and chemically treated to remove all traces of grease and foreign material, painted exhaust hoods shall be primed and repainted with a minimum of two coats of primer and fire resistant paint, filters shall be replaced with grease extractor type filters to match design air volume requirements and fusible links shall be replaced with proper heat values. Fire system shall be inspected and recharged to full operational condition. Fire system nozzles and related piping and fittings shall be relocated and reworked to accommodate the new equipment arrangement with nozzle heads replaced as required. All ductwork shall be inspected to assure compliance with present codes and statutes with all ductwork thoroughly cleaned. Air movement shall be measured for proper air quantities and velocities and conditions corrected to meet proper requirements. All conditions of the existing exhaust ventilation



and fire protection system shall be in compliance with all current prevailing codes, statutes and NFPA requirements.

- D. All nameplates are to be left completely legible.
- E. Existing equipment to be reused shall have all utilities disconnected, terminated, or capped-off by the Plumbing, Electrical and Mechanical (HVAC) Trades.
- F. Plumbing, Electrical and Mechanical (HVAC) Trades shall provide all mechanical, electrical and HVAC services as required and provide final connection to same at the new site location.
- G. Final determination and verification of Plumbing, Electrical and Mechanical (HVAC) requirements for all existing food service equipment to be reused is the responsibility of the Mechanical and Electrical Engineer. Provisions for relocated utility requirements shall conform to current codes and statutes.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions with Installer for compliance with requirements for installation tolerances, service-utility connections and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Examine roughing-in for piping, mechanical and electrical systems to verify actual locations of connections before installation

#### 3.2 INSTALLATION

- A. Set each item of fixed food service equipment securely in place, level and adjust to correct height. Anchor to supporting surface where required for sustained operation and use without shifting or dislocation. Provide concealed anchoring where possible. Adjust work surfaces to a level tolerance of 1/16" maximum offset and slope drainage surfaces at 1/16" per foot.
- B. Complete field assembly of field joints by welding or bolting utilizing the method as indicated with the fixture. Grind all field welds smooth and polish. Set and trim all gaskets to be installed as part of field assembly.
- C. Treat enclosed spaces that are inaccessible after food service equipment installation by covering all horizontal surfaces with powdered borax at a rate of 4 ounces per square foot.
- D. Provide closure trim pieces fabricated of 16 gauge stainless steel or of material and finish as specified, trim shall be one piece construction furnished to seal both horizontal and vertical junctures and openings where the conditions given below occur:

1. Food service equipment is installed into wall openings. Trim shall apply to both sides of wall opening with all corners fully welded, ground smooth and polished.
  2. Two or more items of food service equipment are butted together.
  3. Food service equipment is installed against wall, columns other equipment resulting in a gap or juncture exceeding 1/4" in width.
  4. An open gap of any size between the juncture or joint between adjoining items of food service equipment, wall or column surfaces which might result in the penetration or collection of grease or vermin.
- E. Provide cut-outs and openings in food service equipment as required to extend plumbing, electric, steam or gas lines through the food service equipment either for interconnection of utility lines or final connection.
- F. Seal around each item of food service equipment with sealant for gaps or spaces less than 1/4" in width and with stainless steel trim for gaps or spaces exceeding 1/4" in width. Closure strips shall conform to the shape and size of the surfaces or juncture to be sealed and shall be neatly scribed for a tight fit.

### 3.3 PROTECTION AND CLEANING

- A. Provide final protection and maintain conditions in a manner acceptable to District, Manufacturer and Installer that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.
- B. After completion of the food service equipment installation and completion of other major work in the food service area remove protective coverings and clean and sanitize all food service equipment both internally and externally. Restore exposed and semi-exposed finished to remove abrasions or other surface damage, polish exposed metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored.

### 3.4 COMMISSIONING

- A. Delay start-up of the food service equipment until utility services have been installed, completed and tested, balanced and adjusted for pressure and voltage, and until water and steam lines have been treated and cleaned for sanitation. Before start-up of the food service equipment lubricate in accordance with manufacturer's instructions.
1. Coordinate food service equipment startup with service-utility testing, balancing and adjustments. Do not operate steam lines before they have been cleaned and sanitized.
- B. Provide on-site demonstration and formal technical training by the manufacturer's technical representative for each item of food service equipment as required to instruct the District and its personnel in the safe operation and sanitation and maintenance of the food service equipment.
- C. Test each item of food service equipment for proper operation.
1. Repair or replace equipment that is defective in operation including units that operate below required capacity or that operate with excessive noise or vibration.

2. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
5. Test water, drain, gas, steam, oil, refrigerant and liquid-carrying components for leaks. Repair or replace leaking components.
6. Train District's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventive maintenance for each food service equipment item.
7. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout".
8. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data".
9. Schedule training with District through Construction Manager with at least seven days advance notice.

### 3.5 SCHEDULE OF EQUIPMENT

- A. Equipment Schedule: Refer to all Contract Documents pertaining to the food service areas. Equipment itemized along with brands and model numbers and salient features establish the standard for construction, operation and engineering criteria.
- B. Equipment indicated below is intended to establish the standard of quality of the food service equipment. Alternate "Equal" products by other manufacturers may be considered if equivalent in design, performance, durability and function.
- C. This document is the intellectual property of Corsi Associates and as such use by any other entity is prohibited.

ITEM #01                      WALK IN COOLER/FREEZER

Quantity:                    One (1)

Manufacturer:              American Panel / Arctic / Norbec

Model:                        Size and shape per plan

Construction:              Furnish and erect two compartment sectional urethane insulated walk-in cooler / freezer assembly.

Walk-in assembly shall bear the UL label and NSF and Factory Mutual seals and meet 2009 Federal Regulations.

Ceiling and wall panels shall be constructed of 4" thick urethane insulation, assembly to be accomplished by the use of integral cam type locking device secured in place during the foaming process. Seams between panels shall be fully insulated with vinyl foamed in place gasket material.

Ceiling and wall panels shall be finished of 18 gauge embossed aluminum on interior and exterior surfaces.

Walk-in assembly shall be provided with 1/8" thick aluminum diamond tread plate floor and integral interior entrance ramp with NSF approved coved corners, insulated with 4" thick urethane insulation and reinforced with 3/4" thick 5-7 ply marine grade plywood underlayment. Floor installation shall be in accordance with manufacturer's recommended practice and shall sit on building floor. Building floor finish shall be flush and smooth to allow a level installation.

Walk-in assembly shall be furnished with in-fitting type door and frame assemblies constructed of 16 gauge stainless steel provided with three self-closing cam action chrome plated hinge assemblies, handles and hardware.

Provide each door with 2" dial type flush mount thermometer with chrome plated bezel mounted in door frame.

Provide each door with triple pane observation and 48" high thick aluminum diamond tread kick plate on both interior and exterior side.

Provide each door with UL listed vapor-proof LED light fixture complete with toggle switch and pilot light and full perimeter frame condensation heater.

Provide four (4) UL listed vapor-proof LED ceiling mounted light fixtures complete with stainless steel mounting hardware (two in each section).

Foodservice Equipment Contractor shall install ceiling mounted light fixtures and furnish materials and inter-wire light fixtures and switch.

Walk-in freezer assembly shall be furnished with heated pressure relief port.

Furnish and install 18 gauge embossed aluminum vertical trim angles and ceiling closure panels. Provide 18 gauge embossed aluminum removable louvered air circulation panels for access to condensing units.

Furnish and install entire refrigeration system complete with semi-hermetic condensing units and insulated copper refrigeration lines charged with R404A refrigerant. Each condensing unit shall be interconnected to a low profile, high velocity evaporator coil in each walk-in compartment. Refrigeration system shall include all fittings, valves, switches, controls and all related components to comprise a complete operating unit of sufficient BTU capacity to maintain automatic operation of 35 degree F product temperature in cooler and -10 degree F product temperature in freezer.

Refrigeration system shall be provided with outdoor remote air cooled condensing units with each condensing unit to be located outdoors on the building roof.

Condensing units shall be provided with winterized controls (low ambient package) including crankcase heater, head pressure control, dryers, and galvanized steel stand with hinged louvered weather hood.

Provide all hangers and brackets as required to install refrigeration lines.

Construction Trade shall furnish all sleeves and openings through walls for passage of refrigeration lines.

Secure condensing unit stands to building roof; Roofing Trade shall provide water-proof roof opening for passage of refrigeration lines.

Foodservice Equipment Contractor shall furnish materials and inter-wire defrost time clock circuit for walk-in freezer, from condensing unit to evaporator coil.

Foodservice Equipment Contractor shall furnish materials and install (wrap with foam pipe insulation) heat tracing tape to each evaporator coil condensate line in walk-in freezer.

Foodservice Equipment Contractor shall furnish and install copper tubing and extend evaporator coil condensate line to floor receptacle.

Set and adjust all temperature and defrost cycles.

Provide start-up and two year material and labor warranty on entire refrigeration system and five years manufacturers warranty on compressor.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #02	EVAPORATOR, WALK-IN COOLER
Quantity:	One (1)
Manufacturer:	American Panel / Artic / Norbec
Model:	ADT070
Sup Info:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #03	CONDENSING UNIT, WALK-IN COOLER
Quantity:	One (1)
Manufacturer:	American Panel / Artic / Norbec
Model:	FFAM – A08Z (R-448A)
Sup Info:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #04	EVAPORATOR, WALK-IN FREEZER
Quantity:	One (1)
Manufacturer:	American Panel / Artic / Norbec
Model:	ADT075
Sup Info:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #05	CONDENSING UNIT, WALK-IN FREEZER
Quantity:	One (1)
Manufacturer:	American Panel / Artic / Norbec
Model:	AVA2510ZXTXC
Sup Info:	Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

- ITEM #06                      WORK TABLE, STAINLESS STEEL TOP  
Quantity:                      One (1)  
Manufacturer:                  Eagle Group / Advance Tabco / John Boos  
Model:                          T3084SE-BS  
Options:                        Custom length 78"  
E35 Apron in front of sink or cutout, 16 gauge ss, per linear foot (3)  
E22 Weld-in sink bowl  
351585 Sink cover  
E47 Sink cover holder  
313304 Deck mount faucet  
300720 Lever twist drain  
YCORSI-502971-MOD Drawer  
-L Drawer lock
- ITEM #07                      SHELVING, WALL MOUNTED  
Quantity:                      Two (2)  
Manufacturer:                  Eagle Group / Advance Tabco / John Boos  
Model:                          WS1284-14/3  
Options:                        Custom length 78"  
Sup Info:                      Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.
- ITEM #08                      HAND SINK  
Quantity:                      Two (2)  
Manufacturer:                  Eagle Group / Advance Tabco / John Boos  
Model:                          HSAP-14-ADA-FW  
Options:                        313305 T&S heavy duty gooseneck faucet (2)  
Paper towel dispenser (2)  
Soap dispenser (2)  
-LRS Left and right side splashes (2)  
Sup Info:                      Furnish stainless steel mounting hardware of proper type for wall construction and to sustain weight while in use.
- Construction Trade shall provide wall blocking as required for mounting.
- Foodservice Equipment Contractor to verify soap dispenser and paper towel dispenser type with the owner.
- ITEM #09                      FOUR OPEN BURNER RANGE  
Quantity:                      One (1)  
Manufacturer:                  Garland / Vulcan / Imperial  
Model:                          M44R  
Options:                        Stainless steel sides  
Stainless steel back  
Rear gas connection  
Stainless steel manifold covers  
Manifold end caps  
Swivel casters with polyurethane tires and front locking brakes  
2670200 Gas pressure regulator

Sup Info: M34SD Backguard flue riser  
Dormont 1675KIT48PS gas hose kit  
Foodservice Equipment Contractor shall install disconnect at wall connection and to cooking appliance per manufacturer's instructions.

Foodservice Equipment Contractor shall provide and secure restraining cable between wall and equipment.

ITEM #10 EXHAUST HOOD WITH PLENUM BOX MAKE-UP AIR  
Quantity: One (1)  
Manufacturer: Caddy / Halton / Gaylord  
Model: Size and shape as per plan  
Construction: Furnish and install exhaust hood with integral plenum box make-up air system.

Entire exhaust ventilation system shall be constructed in compliance with UL, NSF, NFPA, Factory Mutual, IMC 2015 (including automatic start-up of the exhaust and supply ventilation upon activation of any cooking appliance) and any prevailing statutes and codes.

Hood shall be '19-0" long constructed in two equal sections of 18 gauge 304 stainless steel with all seams continuously welded, ground smooth and polished. Provide a full complement of stainless steel high efficiency baffle type grease extractors.

Furnish remote bulb thermostat with watertight hardware and install in either the exhaust plenum of the hood or in the exhaust duct. Provide NEMA 3 control panel box with hinged front cover complete with supply and exhaust fan contactors wired to an adjustable thermostat control, field wiring terminal strip and on-off switch.

Provide 18 gauge 304 stainless steel supply and exhaust duct collars.

Provide 18 gauge 304 stainless steel insulated supply air plenum box assembly along the face of the hood. Mount in finished ceiling along face of hood and furnish full length stainless steel perforated removable panels for discharge of supply air along entire face of hood.

Provide stainless steel threaded hanger rods complete with stainless steel mounting hardware for securing to structural ceiling.

Mechanical (HVAC) Trade shall furnish and install a complete exhaust air handling system including exhaust fan and controller, fan start-stop switch with status lights, 16 gauge insulated welded ductwork from exhaust collar on exhaust hood to fan, hinged roof curb with grease trough and removable grease container.

Mechanical (HVAC) Trade shall install exhaust hood heat detector(s) in exhaust hoods with multiple exhaust collars in the exhaust duct just after the point of the pant leg juncture; this includes punching of the required hole in the duct and installation of the heat detector and fitting.

Mechanical (HVAC) Trade shall furnish and install a complete supply air handling system including supply fan and controller (with maintainable filter system) and supply air heater with thermostat control (to temper incoming supply air below 65 degree

F ambient), fan start-stop switch with indicator lights, galvanized steel ductwork from supply collar on exhaust hood to fan and roof curb.

Electrical Trade shall furnish and install interconnecting wiring between fan motors, controllers, and switches.

Electrical Trade shall furnish and install inter-wiring of cooking appliance start-up inter-lock device and the supply and exhaust ventilation system and wire per the manufacturer's instructions and per applicable codes.

Furnish four (4) UL listed vapor-proof recessed LED light fixtures wired to a common on-off switch with stainless steel cover plate located on the wall adjacent to the exhaust ventilator.

Electrical Trade shall furnish materials and inter-wire light fixtures to wall switch.

Mechanical (HVAC) Trade shall furnish fans set compatible with variable frequency drive specification.

Electrical Trade shall furnish and install Interconnecting wiring of the system between the exhaust hood sensors, remote frequency drive unit and exhaust and supply fan motors.

Furnish and install 18 gauge stainless steel wall panels (insulated with 1" minimum thickness of mineral wool or equal if wall surface behind exhaust hood is less than 2 hour fire rated construction) extending from the bottom of the rear of the exhaust hood to the upper edge of the baseboard molding and extending along the full length of all wall surfaces. Wall panel sections shall be fitted with 1/2" wide off-set seams at intermediate joints to allow panel sections to fit tightly against the wall and to result in watertight seams. Secure wall panels to building wall with wall panel adhesive of proper type for wall construction. Seal end seams with General Electric or equivalent clear silicone sealer.

Refer to latest approved Engineering Drawings for engineering data and design methods and features which shall take precedence to this specification.

ITEM #10.1

FIRE SUPPRESSION SYSTEM

Quantity:

One (1)

Manufacturer:

Ansul Fire Protection

Model:

R-102

Construction:

Entire system shall be furnished and installed in compliance with UL, NSF, NFPA, Factory Mutual, IMC 2015 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17-27.

Furnish and install in exhaust hood as part of fire system, mechanically operated fusible link temperature detection system to activate entire fire system in event of fire.

All piping and nozzles of fire system shall be factory installed in exhaust hood, exposed piping, nozzles, and fittings shall be chrome plated.



Inter-wiring of the fire system to the exhaust hood shall be furnished and installed by the Electrical Trade.

Provide as part of fire system, mechanically operated gas supply line shut-off valve to interrupt gas supply to all gas operated cooking appliances. Gas valve shall be provided with manual reset to prevent gas flow to pilot devices on appliances prior to re-start.

Provide one remote manual pull station to actuate fire system in the event of a fire.

Plumbing Trade shall install gas shut-off valve in gas supply line.

Electrical Trade shall furnish and install electric shunt-trip circuit breakers or electric shut-off contactors to interrupt electric power to all electrically operated cooking appliances.

Provide dry contacts in fire system to interface with building fire alarm system as required, electrical tie-in shall be the responsibility of the Electrical Trade.

Provide as part of fire system, start-up testing of the fire system as required by local fire codes. Subsequent testing of the fire system for a period of one year after start-up shall be included as part of this contract.

ITEM #10.2	HOOD CONTROL PANEL
Quantity:	One (1)
Manufacturer:	Caddy / Halton / Gaylord
Construction:	Fan control panel to be mounted on top of the ventilator in a NEMA 4 painted enclosure. Enclosure to house a terminal block for field interlocks for the exhaust fan, supply fan, fire suppression system, wall mounted fan and light switches and factory interlocks for the ventilator surface lights and auto-start thermostats. The fan control panel shall include a 5-minute time delay for the auto-start activation of the exhaust and supply fan to eliminate fan cycling. Fan control panel to comply with the IMC Fan Interlock Code 507.2.1.1 to automatically activate the fans via thermostatic interlock during cooking operations in lieu of manual activation.
ITEM #11	SPARE NUMBER
ITEM #12	FIVE TIER DRY STORAGE SHELVING
Quantity:	One (1)
Manufacturer:	Metro / Nexel / Eagle Group
Model:	PR2436NK3 (5)
Options:	74UPK3 Posts (4) 5MP Casters (2) 5MPB Casters (2)
Sup Info:	Assemble into five tier shelving units, locate bottom shelf 12" above floor.
ITEM #13	FIVE TIER DRY STORAGE SHELVING
Quantity:	Two (2)
Manufacturer:	Metro / Nexel / Eagle Group
Model:	PR2442NK3 (10)

Options: 74UPK3 Posts (8)  
5MP Casters (4)  
5MPB Casters (4)  
Sup Info: Assemble into five tier shelving units, locate bottom shelf 12" above floor.

ITEM #14 FIVE TIER DRY STORAGE SHELVING  
Quantity: Two (2)  
Manufacturer: Metro / Nexel / Eagle Group  
Model: PR2472NK3 (10)  
Options: 74UPK3 Posts (8)  
5MP Casters (4)  
5MPB Casters (4)  
Sup Info: Assemble into five tier shelving units, locate bottom shelf 12" above floor.

ITEM #15 DELI COUNTER  
Quantity: One (1)  
Manufacturer: Duke / LTI / Atlas  
Model: Size and shape per plan  
Construction: Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Openings shall have radius corners and shall be reinforced with additional material.  
Where drop-in appliances are to set on tops, the fixture shall be furnished with a 3/4" thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material.

Fabricate tray slide of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Furnish 3/4" thick marine grade plywood sub-top. Provide three 1/4" x 1/2" square solid stainless steel runners. Locate one runner in center and one runner set 1" from front and rear edges. Mount tray slide on 14 gauge stainless steel fixed cantilever brackets secured through counter front to 1/8" thick stainless steel backing plates.

Counter base shall be enclosed on the front, rear and ends with 18 gauge stainless steel angle frame type construction. Entire counter base shall be supported with an angle iron frame fabricated of a fully welded 1-1/2" x 1-1/2" x 1/8" stainless steel angle frame.

All appliances and components to be furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instructions, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code with all wiring extended to a junction box connection point in counter base with all wires tagged and identified.

Furnish utility chases through counter body and die-raised openings in counter top for passage of plumbing and utility lines.

Provide 12 gauge stainless steel 1" x 5" x 1" "hat" type leg mounting channels extending full width of counter on centers not to exceed 48" in length and fully welded to the angle iron frame. Mount counter assembly on 6" high stainless steel counter type conical legs with stainless steel adjustable bullet feet fully welded to leg mounting channels.

Counter front and exposed ends shall be provided with high pressure laminated plastic faced panels close fitted with hairline joints and secured in position in a concealed manner and removable without the use of tools. Laminate selection to be made by the Architect/Owner.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

ITEM #16 HEATED ZONE MERCHANDISER

Quantity: One (1)  
Manufacturer: Hatco / Merco  
Model: HZMH-42D

ITEM #17 HEATED SHELF FOOD WARMER

Quantity: One (1)  
Manufacturer: Hatco / Nemco / Vollrath  
Model: GRSBF-36-I  
Options: Thermostat control with lighted rocker switch  
Flat top

ITEM #18 REFRIGERATED SANDWICH UNIT

Quantity: Two (2)  
Manufacturer: Continental / Victory / True  
Model: SW36N10-FB  
Options: Stainless steel interior  
Stainless steel exterior  
Stainless steel case back  
Flat removeable lid  
Automatic condensate evaporator  
Exterior mounted dial thermometer  
Swivel casters with polyurethane tires and front locking brakes  
Plug and cord set  
Two stainless steel adjustable wire shelves in each section  
10" wide full length polyethylene cutting board  
Pan openings in top  
Stainless steel hinged night cover

ITEM #19 DROP-IN HOT/COLD WELL

Quantity: One (1)  
Manufacturer: LTI / Delfield / Hatco  
Model: DI-QSCHP-3  
Options: Individual drains with manifold and shut-off valve

Remote individual thermostat control with master on-off switch with indicator light  
Auto fill assembly

ITEM #20            SNEEZE GUARD  
Quantity:           One (1)  
Manufacturer:       BSI / Premier Brass / English  
Model:               ZG9930  
Options:             Size and shape as per plan  
                         Stainless steel tubing  
                         Brushed aluminum finish  
                         3/8" tempered glass  
                         1" radius corner  
                         End panels  
                         605 double warmer and light combo  
                         MWU5 millwork undercounter mount

ITEM #21            SNEEZE GUARD  
Quantity:           One (1)  
Manufacturer:       BSI / Premier Brass / English  
Model:               ZG9500-3  
Options:             Size and shape as per plan  
                         Stainless steel tubing  
                         Brushed aluminum finish  
                         3/8" tempered glass  
                         1" radius corner  
                         End panels  
                         605 double warmer and light combo  
                         MWU5 millwork undercounter mount

ITEM #22            SPARE NUMBER

ITEM #23            AIR SCREEN  
Quantity:           One (1)  
Manufacturer:       RPI / Federal / Structural Concepts  
Model:               SCAS48R-II-PD  
Options:             High humidity package  
                         Roll-down locking security shutter  
                         Air cooled self-contained condensing unit  
                         Front condensing unit air discharge  
                         Rear access doors  
                         Four solid black adjustable shelves  
                         Exterior mounted digital thermometer  
                         Extra capacity automatic condensate evaporator  
                         LED lights on top and below each shelf  
                         Solid black interior finish  
                         Solid black mirrored ends  
                         Solid black interior finish  
                         Black Trim  
                         Exterior finish selected by Architect/Owner  
                         Five year compressor warranty

Unit should be prepared to be drained into floor sink in field

ITEM #24 GLASS DOOR MERCHANDISER

Quantity: One (1)

Manufacturer: True / Continental / Victory

Model: GDM-49RL-HC~TSL01

Options: Air cooled self-contained condensing unit

Left door hinged left; right door hinged on right

Exterior: Permanent non-peel non-chip black vinyl, standard

Interior: White aluminum, standard

S-PB Sign, plain black in lieu of standard

ITEM #25 BEVERAGE COUNTER

Quantity: One (1)

Manufacturer: Duke / LTI / Atlas

Model: Size and shape per plan

Construction: Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a  $\frac{3}{4}$ " thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material.

Fabricate tray slide of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Furnish  $\frac{3}{4}$ " thick marine grade plywood sub-top. Provide three  $\frac{1}{4}$ " x  $\frac{1}{2}$ " square solid stainless steel runners. Locate one runner in center and one runner set 1" from front and rear edges. Mount tray slide on 14 gauge stainless steel fixed cantilever brackets secured through counter front to  $\frac{1}{8}$ " thick stainless steel backing plates.

Counter base shall be enclosed on the front, rear and ends with 18 gauge stainless steel angle frame type construction. Entire counter base shall be supported with an angle iron frame fabricated of a fully welded 1-1/2" x 1-1/2" x 1/8" stainless steel angle frame.

All appliances and components to be furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instructions, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code with all wiring extended to a junction box connection point in counter base with all wires tagged and identified.

Furnish utility chases through counter body and die-raised openings in counter top for passage of plumbing and utility lines.

Provide 12 gauge stainless steel 1" x 5" x 1" "hat" type leg mounting channels extending full width of counter on centers not to exceed 48" in length and fully welded to the angle iron frame. Mount counter assembly on 6" high stainless steel counter type conical legs with stainless steel adjustable bullet feet fully welded to leg mounting channels.

Counter front and exposed ends shall be provided with high pressure laminated plastic faced panels close fitted with hairline joints and secured in position in a concealed manner and removable without the use of tools. Laminate selection to be made by the Architect/Owner.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

ITEM #26 SODA DISPENSER

Quantity: One (1)

Sup Info: Not in foodservice contract, furnished by owner.

ITEM #27 ICE MAKER

Quantity: One (1)

Manufacturer: Hoshizaki

Model: KM-901MAJ

ITEM #27F ICE MAKER WATER FILTER

Quantity: One (1)

Manufacturer: Everpure

Model: EV9324-02

EV960651 replacement cartridge

Sup Info: Foodservice Equipment Contractor shall install ice maker filter system in water supply line and furnish and install interconnecting piping between water filter and ice maker water inlet.

ITEM #28 JUICE DISPENSER

Quantity: One (1)

Sup Info: Not in foodservice contract, furnished by owner.

ITEM #28F JUICE DISPENSER WATER FILTER

Quantity: One (1)

Manufacturer: Everpure

Model: EV927200

EV961250 replacement cartridge

Sup Info: Foodservice Equipment Contractor shall install juice dispenser filter system in water supply line and furnish and install interconnecting piping between water filter and juice dispenser water inlet.

ITEM #29 GLASS DOOR MERCHANDISER

Quantity: One (1)

Manufacturer: True / Continental / Victory

Model: GDM-23-HC~TSL01

Options: Air cooled self-contained condensing unit

Door hinged right, standard  
Exterior: Black powder coated steel, standard  
Interior: White aluminum, standard  
S-PB Sign, plain black in lieu of standard

ITEM #30                    COFFEE MAKER  
Quantity:                One (1)  
Sup Info:                Not in foodservice contract, furnished by owner.

ITEM #30F                COFFEE MAKER WATER FILTER  
Quantity:                One (1)  
Manufacturer:           Everpure  
Model:                   EV927200  
                                EV961250 replacement cartridge  
Sup Info:                Foodservice Equipment Contractor shall install coffee maker filter system in water supply line and furnish and install interconnecting piping between water filter and coffee maker water inlet.

ITEM #31                    TEA BREWER  
Quantity:                One (1)  
Sup Info:                Not in foodservice contract, furnished by owner.

ITEM #31F                TEA BREWER WATER FILTER  
Quantity:                One (1)  
Manufacturer:           Everpure  
Model:                   EV927200  
                                EV961250 replacement cartridge  
Sup Info:                Foodservice Equipment Contractor shall install tea brewer filter system in water supply line and furnish and install interconnecting piping between water filter and tea brewer water inlet.

ITEM #32                    COFFEE SERVER  
Quantity:                Five (5)  
Sup Info:                Not in foodservice contract, furnished by owner.

ITEM #33                    DROP-IN COLD WELL  
Quantity:                One (1)  
Manufacturer:           LTI / Delfield / Wells  
Model:                   DI-2025TA  
Options:                  Individual drains with manifold and shut-off valve

ITEM #34                    COFFEE COUNTER  
Quantity:                One (1)  
Manufacturer:           Duke / LTI / Atlas  
Model:                   Size and shape per plan  
Construction:           Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a ¾" thick marine grade plywood sub-top fabricated with a perimeter frame extending

through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material.

Fabricate tray slide of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Furnish  $\frac{3}{4}$ " thick marine grade plywood sub-top. Provide three  $\frac{1}{4}$ " x  $\frac{1}{2}$ " square solid stainless steel runners. Locate one runner in center and one runner set 1" from front and rear edges. Mount tray slide on 14 gauge stainless steel fixed cantilever brackets secured through counter front to  $\frac{1}{8}$ " thick stainless steel backing plates.

Counter base shall be enclosed on the front, rear and ends with 18 gauge stainless steel angle frame type construction. Entire counter base shall be supported with an angle iron frame fabricated of a fully welded 1-1/2" x 1-1/2" x  $\frac{1}{8}$ " stainless steel angle frame.

All appliances and components to be furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instructions, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code with all wiring extended to a junction box connection point in counter base with all wires tagged and identified.

Furnish utility chases through counter body and die-raised openings in counter top for passage of plumbing and utility lines.

Provide 12 gauge stainless steel 1" x 5" x 1" "hat" type leg mounting channels extending full width of counter on centers not to exceed 48" in length and fully welded to the angle iron frame. Mount counter assembly on 6" high stainless steel counter type conical legs with stainless steel adjustable bullet feet fully welded to leg mounting channels.

Counter front and exposed ends shall be provided with high pressure laminated plastic faced panels close fitted with hairline joints and secured in position in a concealed manner and removable without the use of tools. Laminate selection to be made by the Architect/Owner.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

**ITEM #35**

Quantity:

Manufacturer:

Model:

Construction:

**CASHIER COUNTER**

One (1)

Duke / LTI / Atlas

Size and shape per plan

Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated.



Fabricate cashier stand with 18 gauge stainless steel lined double wall knee recess at end of counter. Provide 14 gauge stainless steel foot rest shelf at bottom of knee recess. Top of shelf shall be set 6" from front of counter body and shall be 10" above finished floor. At rear of knee recess provide electric receptacle with stainless steel faceplate.

Counter top above receptacle shall be provided with die-raised utility opening for cord passage. Provide cashier drawer with 3" high drawer pan constructed of 14 gauge stainless steel with inside corners coved on a 3/4" radius. Drawer front face shall be double pan type constructed of 16 gauge stainless steel with inner pan set into outer pan and welded in place. Drawer front shall be set into and shall be removable from a 14 gauge stainless steel channel shaped drawer cradle. Drawer suspension slides shall be Component Hardware S52 Series secured to drawer frame assembly and shall be full extension type with stainless steel wheels and ball bearings having a load capacity of 200 pounds. Provide hard rubber bumper drawer stops. Drawer suspension guides shall be fastened to 18 gauge stainless steel housing which is suspended from the angle framing under the table top. Provide drawer fronts with full grip recessed stainless steel flush pull handles. Provide interior of drawer with removable compartment cash drawer pan. Drawer face shall be provided with chrome plated cylinder lock assembly with two keys.

Counter front and exposed ends shall be provided with high pressure laminated plastic faced panels close fitted with hairline joints and secured in position in a concealed manner and removable without the use of tools. Laminate selection to be made by the Architect/Owner.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

ITEM #36                      P.O.S.  
Quantity:                   One (1)  
Sup Info:                   Not in foodservice contract, furnished by owner.

ITEM #37                      ORDER KIOSK COUNTER  
Quantity:                   One (1)  
Manufacturer:              Duke / LTI / Atlas  
Model:                      Size and shape per plan  
Construction:              Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a 3/4" thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material.

Counter base shall be enclosed on the front, rear and ends with 18 gauge stainless steel angle frame type construction. Entire counter base shall be supported with an angle iron frame fabricated of a fully welded 1-1/2" x 1-1/2" x 1/8" stainless steel angle frame.

Provide working side of cabinet base with stainless steel NEMA 4 electrical panel box with main and individual circuit breakers for all related electrical appliances and components. The panel box shall be provided with shunt-trip circuit breakers for all electrically operated cooking appliances. All appliances and components furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instructions, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code. The entire counter assembly shall bear the UL seal.

Furnish utility chases through counter body and die-raised openings in counter top for passage of plumbing and utility lines.

Provide 12 gauge stainless steel 1" x 5" x 1" "hat" type leg mounting channels extending full width of counter on centers not to exceed 48" in length and fully welded to the angle iron frame. Mount counter assembly on 6" high stainless steel counter type conical legs with stainless steel adjustable bullet feet fully welded to leg mounting channels.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

ITEM #38

ORDER SCREEN

Quantity:

Two (2)

Sup Info:

Not in foodservice contract, furnished by owner.

ITEM #39

ORDER KIOSK COUNTER

Quantity:

One (1)

Manufacturer:

Duke / LTI / Atlas

Model:

Size and shape per plan

Construction:

Fabricate counter top of solid surface material. Material shall be fabricated and assembled per manufacturers approved methods utilizing a factory authorized and certified fabricator and installer. The edges of the top shall be formed as indicated. Openings shall have radius corners and shall be reinforced with additional material. Where drop-in appliances are to set on tops, the fixture shall be furnished with a 3/4" thick marine grade plywood sub-top fabricated with a perimeter frame extending through the opening in the top preventing the appliance from setting directly on the solid surface material and allowing the sub-top to distribute the weight of the appliance. Where heated appliances are to set on the top the sub-top is to be fabricated as above to prevent heat from being in direct contact with the solid surface top; additional fiberboard insulation material is to be provided where transfer of radiated heat will contact any solid surface material.

Counter base shall be enclosed on the front, rear and ends with 18 gauge stainless steel angle frame type construction. Entire counter base shall be supported with an

angle iron frame fabricated of a fully welded 1-1/2" x 1-1/2" x 1/8" stainless steel angle frame.

Provide working side of cabinet base with stainless steel NEMA 4 electrical panel box with main and individual circuit breakers for all related electrical appliances and components. The panel box shall be provided with shunt-trip circuit breakers for all electrically operated cooking appliances. All appliances and components furnished as built-in equipment as part of the counter shall be factory installed per the manufacturer's instructions, all electrical wiring and components shall conform to UL and shall be installed in accordance with the National Electric Code. The entire counter assembly shall bear the UL seal.

Furnish utility chases through counter body and die-raised openings in counter top for passage of plumbing and utility lines.

Provide 12 gauge stainless steel 1" x 5" x 1" "hat" type leg mounting channels extending full width of counter on centers not to exceed 48" in length and fully welded to the angle iron frame. Mount counter assembly on 6" high stainless steel counter type conical legs with stainless steel adjustable bullet feet fully welded to leg mounting channels.

Provide 6" high recessed toe base on customers side and exposed ends fabricated of 18 gauge 304 stainless steel and secured to counter base for removal without tools.

ITEM #40	FOUR TIER WALK IN STORAGE SHELVING
Quantity:	One (1)
Manufacturer:	Metro / Nexel / Eagle Group
Model:	PR2430NK3 (4)
Options:	70UPK3 Posts (4) 5MP Casters (2) 5MPB Casters (2)
Sup Info:	Assemble into four tier shelving units, locate bottom shelf 12" above floor.
ITEM #41	FOUR TIER WALK IN STORAGE SHELVING
Quantity:	Four (4)
Manufacturer:	Metro / Nexel / Eagle Group
Model:	PR1860NK3 (16)
Options:	70UPK3 Posts (16) 5MP Casters (8) 5MPB Casters (8)
Sup Info:	Assemble into four tier shelving units, locate bottom shelf 12" above floor.
ITEM #42	FOUR TIER WALK IN STORAGE SHELVING
Quantity:	Two (2)
Manufacturer:	Metro / Nexel / Eagle Group
Model:	PR2460NK3 (8)
Options:	70UPK3 Posts (8) 5MP Casters (4) 5MPB Casters (4)
Sup Info:	Assemble into four tier shelving units, locate bottom shelf 12" above floor.

ITEM #43            FOUR TIER WALK IN STORAGE SHELVING  
Quantity:           Two (2)  
Manufacturer:       Metro / Nexel / Eagle Group  
Model:               PR2442NK3 (8)  
Options:              70UPK3 Posts (8)  
                         5MP Casters (4)  
                         5MPB Casters (4)  
Sup Info:             Assemble into four tier shelving units, locate bottom shelf 12" above floor.

#### EXISTING EQUIPMENT

ITEM X01           EXISTING REACH IN FREEZER  
Quantity:           One (1)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X02           COUNTERTOP CONVEYOR OVEN  
Quantity:           One (1)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X03           GAS FRYER  
Quantity:           Three (3)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X04           EQUIPMENT STAND  
Quantity:           One (1)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X05           COUNTERTOP GRIDDLE  
Quantity:           One (1)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X06           ELECTRIC CONVECTION OVEN  
Quantity:           One (1)  
Sup Info:            Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

ITEM X07           REACH IN REFRIGERATOR  
Quantity:           One (1)

Sup Info:	Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.
ITEM X08	WIRE SHELVING
Quantity:	Four (4)
Sup Info:	Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.
ITEM X09	WIRE SHELVING
Quantity:	One (1)
Sup Info:	Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.
ITEM X10	WIRE SHELVING
Quantity:	One (1)
Sup Info:	Refer to Specification Section 2.6, Standards for Existing Equipment; survey the existing item of equipment to be reused to determine the extent of reconditioning or repairs necessary to place equipment in proper working order.

END OF SECTION 114000

## SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Water-hammer arresters.
  - 2. Trap-seal primer device.
- B. Related Requirements:
  - 1. Section 22 11 16 "Domestic Water Piping" for water meters.

#### 1.3 DEFINITIONS

- A. AMI: Advanced Metering Infrastructure.
- B. AMR: Automatic Meter Reading.
- C. FKM: A family of fluoroelastomer materials defined by ASTM D1418.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
  - 1. Include diagrams for power, signal, and control wiring.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Test and inspection reports.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. AMTROL, Inc.
    - b. Jay R. Smith Mfg Co; a division of Morris Group International.
    - c. Josam Company.
    - d. MIFAB, Inc.
    - e. Precision Plumbing Products.
    - f. Sioux Chief Manufacturing Company, Inc.
    - g. WATTS.
    - h. Zurn Industries, LLC.
  - 2. Standard: ASSE 1010 or PDI-WH 201.
  - 3. Type: Piston.
  - 4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.4 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Jay R. Smith Mfg Co; a division of Morris Group International.
  - b. Josam Company.
  - c. MIFAB, Inc.
  - d. Precision Plumbing Products.
  - e. Sioux Chief Manufacturing Company, Inc.
  - f. WATTS.
  - g. Zurn Industries, LLC.
2. Standard: ASSE 1018.
  3. Pressure Rating: 125 psig minimum.
  4. Body: Bronze.
  5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
  6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
  7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.
- B. Supply-Type, Trap-Seal Primer Device: Install with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

#### 3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

#### 3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.



### 3.4 CONTROL CONNECTIONS

- A. Connect control wiring in accordance with Section 26 05 23 "Control-Voltage Electrical Power Cables."

### 3.5 IDENTIFICATION

- A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Water-Hammer Arresters.
  - 2. Trap-seal primer device.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

### 3.6 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 22 11 19

SECTION 23 09 50 - BUILDING AUTOMATION SYSTEM (BAS) GENERAL (ALTERNATE)

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General Requirements
- B. Description of Work
- C. Quality Assurance
- D. System Architecture
- E. Distributed Processing Units/Quantity and Location
- F. Demolition and Reuse of Existing Materials and Equipment
- G. Sequence of Work

1.02 RELATED DOCUMENTS

- A. Section 23 09 69 - Variable Frequency Controllers (Alternate)
- B. Section 23 09 51 - Building Automation System (BAS) Basic Materials, Interface Devices, and Sensors (Alternate)
- C. Section 23 09 53 - BAS Field Panels (Alternate)
- D. Section 23 09 54 - BAS Communication Devices (Alternate)
- E. Section 23 09 55 - BAS Software and Programming (Alternate)
- F. Section 23 09 58 - Sequences of Operation (Alternate)
- G. Section 23 09 59 - BAS Commissioning (Alternate)

1.03 DESCRIPTION OF WORK

- A. The building automation system (BAS) defined in this specification shall interface with the Delaware Technical Community College (DTCC) Network and shall utilize the BACnet communication requirements as defined by ASHRAE/ANSI 135 (current version and addendum) for all communication.
- B. Contractor shall furnish and install a new building automation system (BAS). The new BAS shall utilize electronic sensing, microprocessor-based digital control, and electronic actuation of dampers and valves to perform control sequences and functions specified. The BAS for this project will generally consist of monitoring and control of systems listed below. Reference also control drawings, sequences of operation, and points lists.
- C. The systems to be controlled under work of this section basically comprise AHU's, Chillers, Cooling Tower, Pumps, Boilers, VAV Boxes and all existing Pneumatic to remain. This Section defines the manner and method by which these controls function.

1.04 APPLICATION OF OPEN PROTOCOLS

- A. Subject to the detailed requirements provided throughout the specifications, the BAS and digital control and communications components installed, as work of this contract shall be an integrated distributed processing system utilizing BACnet. System components shall communicate using native BACnet in accordance with ASHRAE Standard 135 and current addenda and annexes, including all workstations, all building controllers, and all application specific controllers. Gateways to other communication protocols are not acceptable

#### 1.05 QUALITY ASSURANCE

- A. Product Line Demonstrated History: The product line being proposed for the project must have an installed history of demonstrated satisfactory operation for a length of 2 years since date of final completion in at least 10 installations of comparative size and complexity. Submittals shall document this requirement with references.

The following requirement relates to the actual installing contractor.

- B. Installer's Qualifications: Firms specializing and experienced in control system installations for not less than 5 years. Firms with experience in BAS installation projects with point counts equal to this project and systems of the same character as this project. If installer is a Value Added Reseller (VAR) of a manufacturer's product, installer must demonstrate at least three years prior experience with that manufacturer's products. Experience starts with awarded Final Completion of previous projects. Submittals must document this experience with references.
- C. Installer's Experience with Proposed Product Line: Firms shall have specialized in and be experienced with the installation of the proposed product line for not less than one year from date of final completion on at least 3 projects of similar size and complexity. Submittals shall document this experience with references.
- D. Installer's Field Coordinator and Sequence Programmer Qualifications: Individual(s) shall specialize in and be experienced with control system installation for not less than 5 years. Proposed field coordinator shall have experience with the installation of the proposed product line for not less than 2 projects of similar size and complexity. Installer shall submit the names of the proposed individual and at least one alternate for each duty. Submittals shall document this experience with references. The proposed individuals must show proof of the following training:
  - 1. Product Line Training: Individuals overseeing the installation and configuration of the proposed product line must provide evidence of the most advanced training offered by the Manufacturer on that product line for installation and configuration
  - 2. Programming Training: Individuals involved with programming the site-specific sequences shall provide evidence of the most advanced programming training offered by the vendor of the programming application offered by the Manufacturer.
- E. Installer's Service Qualifications: The installer must be experienced in control system operation, maintenance and service. Installer must document a minimum 5 year history of servicing installations of similar size and complexity. Installer must also document at least a one year history of servicing the proposed product line.

F. Installer's Response Time and Proximity

1. Installer must maintain a fully capable service facility within a 45 mile radius of the project site. Service facility shall manage the emergency service dispatches and maintain the inventory of spare parts.
2. Emergency response times are listed below in this section. Installer must demonstrate the ability to meet the response times.

1.06 CODES AND STANDARDS

A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

1. ASHRAE 135: BACnet - A Data Communication Protocol for Building Automation and Control Networks. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. current edition including all related addenda shall apply.

B. Electronics Industries Alliance

1. EIA-709.1-A-99: Control Network Protocol Specification
2. EIA-709.3-99: Free-Topology Twisted-Pair Channel Specification
3. EIA-232: Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.
4. EIA-458: Standard Optical Fiber Material Classes and Preferred Sizes
5. EIA-485: Standard for Electrical Characteristics of Generator and Receivers for use in Balanced Digital Multipoint Systems.
6. EIA-472: General and Sectional Specifications for Fiber Optic Cable
7. EIA-475: Generic and Sectional Specifications for Fiber Optic Connectors and all Sectional Specifications
8. EIA-573: Generic and Sectional Specifications for Field Portable Polishing Device for Preparation Optical Fiber and all Sectional Specifications
9. EIA-590: Standard for Physical Location and Protection of Below-Ground Fiber Optic Cable Plant and all Sectional Specifications

C. Underwriters Laboratories

1. UL 916: Energy Management Systems.  
The following rating is required only for devices used for smoke control purposes. If these are not intended, delete.
2. UUKL 864: UL Supervised Smoke Control

D. NEMA Compliance

1. NEMA 250: Enclosure for Electrical Equipment
2. NEMA ICS 1: General Standards for Industrial Controls.

E. NFPA Compliance

1. NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.
2. NFPA 70 National Electrical Code (NEC)

F. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems

2. IEEE 802.3: CSMA/CD (Ethernet - Based) LAN
3. IEEE 802.4: Token Bus Working Group (ARCNET - Based) LAN

#### 1.07 DEFINITIONS

- A. Advanced Application Controller (AAC): A device with limited resources relative to the Building Controller (BC). It may support a level of programming and may also be intended for application specific applications.
- B. Application Protocol Data Unit (APDU): A unit of data specified in an application protocol and consisting of application protocol control information and possible application user data (ISO 9545).
- C. Application Specific Controller (ASC): A device with limited resources relative to the Advanced Application Controller (AAC). It may support a level of programming and may also be intended for application-specific applications. .
- D. BACnet/BACnet Standard: BACnet communication requirements as defined by ASHRAE/ANSI 135 (Current edition and addendum).
- E. BACnet Interoperability Building Blocks (BIBB): A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
- F. Binding: In the general sense, binding refers to the associations or mappings of the sources network variable and their intended opr required destinations.
- G. Building Automation System (BAS): The entire integrated management and control system
- H. Building Controller (BC): A fully programmable device capable of carrying out a number of tasks including control and monitoring via direct digital control (DDC) of specific systems, acting as a communications router between the controlled devices / equipment and the CSS, and temporary data storage for trend information, time schedules, and alarm data.
- I. Change of Value (COV): An event that occurs when a measured or calculated analog value changes by a predefined amount (ASHRAE/ANSI 135 (current version and addendum)).
- J. Client: A device that is the requestor of services from a server. A client device makes requests of and receives responses from a server device.
- K. Continuous Monitoring: A sampling and recording of a variable based on time or change of state (e.g. trending an analog value, monitoring a binary change of state).
- L. Controller or Control Unit (CU): Intelligent stand-alone control device. Controller is a generic reference and shall include BCs, AACs, and ASCs as appropriate.
- M. Control Systems Server (CSS): A server class computer(s) that maintains the systems configuration and programming database. This server is located at DTCC data center in a virtual environment and serves as an access point to BAS.
- N. Controlling LAN: High speed, peer-to-peer controller LAN connecting BCs, AACs and ASCs. Refer to System Architecture below.

- O. Direct Digital Control (DDC): Microprocessor-based control including Analog/Digital conversion and program logic
- P. Functional Profile: A collection of variables required to define a the key parameters for a standard application. As this applies to the HVAC industry, this would include applications like VAV terminal, fan coil units, and the like.
- Q. Gateway (GTWY): A device, which contains two or more dissimilar networks/protocols, permitting information exchange between them.
- R. Hand Held Device (HHD): Manufacturer's microprocessor based device for direct connection to a Controller.
- S. LAN Interface Device (LANID): Device or function used to facilitate communication and sharing of data throughout the BAS
- T. Local Area Network (LAN): General term for a network segment within the architecture. Various types and functions of LANs are defined herein.
- U. Local Supervisory LAN: Also known as the State's Network: Ethernet-based network connecting Primary Controlling LANs with each other and OWSs and CSSs. See System Architecture below.
- V. Master-Slave/Token Passing (MS/TP): Data link protocol as defined by the BACnet standard.
- W. Open Database Connectivity (ODBC): An open standard application-programming interface (API) for accessing a database developed. ODBC compliant systems make it possible to access any data from any application, regardless of which database management system (DBMS) is handling the data.
- X. Operator Interface (OI): A device used by the operator to manage the BAS including OWSs, POTs, and HHDs.
- Y. Operator Workstation (OWS): The user's interface with the BAS system. As the BAS network devices are stand-alone, dedicated OWS is not required for communications to occur. The OWS can be any computer on the State's Network that has a compatible Web browser.
- Z. Point-to-Point (PTP): Serial communication as defined in the BACnet standard.
- AA. Portable Operators Terminal (POT): Mobile computer used both for direct connection to a controller as well as network connection.
- AB. Protocol Implementation Conformance Statement (PICS): A written document, created by the manufacturer of a device, which identifies the particular options specified by BACnet that are implemented in the device (ASHRAE/ANSI 135 (current version and addendum)).
- AC. Router: A device that connects two or more networks at the network layer.
- AD. Secondary Controlling LAN: LAN connecting AACs and ASCs, generally lower speed and less reliable than the Controlling LAN. Refer to System Architecture below.

- AE. Server : A device that is a provider of services to a client. A client device makes requests of and receives responses from a server device.
- AF. Standardized Query Language (SQL): A database computer language designed for managing data in relational database management system (RDBMS). Its scope includes data insert, query, update and delete, schema creation and modification, and data access control.
- AG. Smart Device: A control I/O device such as a sensor or actuator that can directly communicate with a controller through the network. This differs from an ASC in that it typically deals only with one variable.
- AH. Extensible Markup Language (XML): A specification developed by the World Wide Web Consortium. XML is a pared-down version of SGML, designed especially for Web documents. It is a set of rules for encoding documents in machine-readable form that allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations.

#### 1.08 FUNCTIONAL INTENT

- A. Throughout Sections 23 09 50 through 23 09 55, the Sequences of Operation, and Section 23 09 59 detailed requirements are specified, some of which indicate a means, method or configuration acceptable to meet that requirement. Contractor may submit products that utilize alternate means, methods, and configurations that meet the functional intent. However these will only be allowed with prior approval.

#### 1.09 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 .
- B. Electronic Submittals: While all requirements for hard copy submittal apply, control submittals and O&M information shall also be provided in electronic format as follows.
1. Drawings and Diagrams: Shop drawings shall be provided on electronic media as an AutoCAD (current version) and/or Adobe Portable Document Format file. All 'X reference' and font files must be provided with AutoCAD files.
  2. Other Submittals: All other submittals shall be provided in Adobe Portable Document Format (PDF).
- C. Qualifications: Manufacturer, Installer, and Key personnel qualifications as indicated for the appropriate item above.
- D. Product Data: Submit manufacturer's technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Also include installation and start-up instructions.
- E. Shop Drawings: Submit shop drawings for each control system, including a complete drawing for each air handling unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Each shop drawing shall contain the following information:
1. System Architecture and System Layout:
    - a. One-line diagram indicating schematic locations of all control units, workstations,

- LAN interface devices, gateways, etc. Indicate network number, device ID, , instance number, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the diagram.
- b. Provide electronic floor plans locating all control units, workstations, LAN interface devices, gateways, etc. Include all network communication wiring routing, power wiring, power originating sources, and low voltage power wiring. Indicate network number, device ID, instance number, MAC address, drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the floor plans. Wiring routing as-built conditions shall be maintained accurately throughout the construction period and the drawing shall be updated to accurately reflect accurate, actual installed conditions.
2. Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices. Include verbal description of sequence of operation.
  3. All physical points on the schematic flow diagram shall be indicated with names, descriptors, and point addresses identified as listed in the point summary table.
  4. With each schematic, provide a point summary table listing building number and abbreviation, system type, equipment type, full point name, point description, Ethernet backbone network number, network number, device ID, object ID (object type, instance number). See Section 23 09 55 - Part III for additional requirements.
  5. Label each control device with setting or adjustable range of control.
  6. Label each input and output with the appropriate range.
  7. Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable.
  8. With each schematic, provide valve and actuator information including size, Cv, design flow, design pressure drop, manufacturer, model number, close off rating, etc. Indicate normal positions of spring return valves and dampers.
  9. Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination drawings on separate drawings. Ladder diagrams shall appear on system schematic. Clearly differentiate between portions of wiring, which are existing, factory-installed and portions to be field-installed.
  10. Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.



11. Sheets shall be consecutively numbered.
  12. Each sheet shall have a title indicating the type of information included and the HVAC system controlled.
  13. Table of Contents listing sheet titles and sheet numbers.
  14. Legend and list of abbreviations.
  15. Memory allocation projections.
  16. Submit along with shop drawings but under separate cover calculated and guaranteed system response times of the most heavily loaded LAN in the system.
- F. Open Protocol Information
1. BACnet Systems:
    - a. BACnet object description, object ID, and device ID, for each I/O point.
    - b. Documentation for any non-standard BACnet objects, properties, or enumerations used detailing their structure, data types, and any associated lists of enumerated values.
    - c. Submit PICS indicating the BACnet functionality and configuration of each controller.
- G. Framed Control Drawings: Laminated control drawings including system control schematics, sequences of operation and panel termination drawings, shall be provided in panels for major pieces of equipment. Terminal unit drawings shall be located in the central plant equipment panel or mechanical room panel.
- H. Control Logic Documentation
1. Submit control logic program listings (for graphical programming) and logic flow charts (for line type programs) to document the control software of all control units.
  2. Control logic shall be annotated to describe how it accomplishes the sequence of operation. Annotations shall be sufficient to allow an operator to relate each program component (block or line) to corresponding portions of the specified Sequence of Operation.
  3. Include written description of each control sequence.
  4. Include control response, settings, setpoints, throttling ranges, gains, reset schedules, adjustable parameters and limits.
  5. Sheets shall be consecutively numbered.
  6. Each sheet shall have a title indicating the controller designations and the HVAC system controlled.
  7. Include Table of Contents listing sheet titles and sheet numbers
  8. Submit one complete set of programming and operating manuals for all digital controllers concurrently with control logic documentation. This set will count toward the required number of Operation and Maintenance materials specified below and in Section 01 30 00.
- I. Operation and Maintenance Materials:
1. Submit documents under provisions of Section 01 03 00. One copy of the materials shall be delivered directly to DTCC facilities operation staff, in addition to the copies required by other Sections.
  2. Submit maintenance instructions and spare parts lists for each type of control

- device, control unit, and accessory.
- 3. Submit BAS User's Guides (Operating Manuals) for each controller type .
- 4. Submit BAS advanced Programming Manuals for each controller type.
- 5. Include all submittals (product data, shop drawings, control logic documentation, hardware manuals, software manuals, installation guides or manuals, maintenance instructions and spare parts lists) in maintenance manual; in accordance with requirements of Division 1.
- J. Controls contractor shall provide DTCC with all product line technical manuals and technical bulletins, to include new and upgraded products, by the same distribution channel as to dealers or branches. This service will be provided for 5 years as part of the contract price, and will be offered to DTCC thereafter for the same price as to a dealer or branch.
- K. Manufacturers Certificates: For all listed and/or labeled products, provide certificate of conformance.
- L. Product Warranty Certificates: submit manufacturers product warranty certificates covering the hardware provided.

#### 1.10 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 30 00.
- B. Record copies of product data and control shop drawings updated to reflect the final installed condition.
- C. Record copies of approved control logic programming and database on paper and on CD's. Accurately record actual setpoints and settings of controls, final sequence of operation, including changes to programs made after submission and approval of shop drawings and including changes to programs made during specified testing.
- D. Record copies of approved project specific graphic software on CDs.
- E. Record copies shall include individual floor plans with controller locations with all interconnecting wiring routing including space sensors, LAN wiring, power wiring, low voltage power wiring. Indicate device instance, MAC address and drawing reference number.
- F. Provide record riser diagram showing the location of all controllers.
- G. Maintain project record documents throughout the warranty period and submit final documents at the end of the warranty period

#### 1.11 SYSTEM ARCHITECTURE

- A. The system provided shall incorporate hardware resources sufficient to meet the functional requirements of these Specifications. The Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.
- B. The system shall be configured as a distributed processing network(s) capable of

expansion as specified below.

- C. The system architecture shall consist of the Ethernet-based Network, and Controlling LANs that support BCs, AACs, ASCs, Operator Workstations (OWS), Smart Devices (SD), and Remote Communication Devices (RCDs) as applicable. The following indicates a functional description of the BAS structure.
1. Network: Internet-based network connecting multiple facilities with a central data and application server, accessible via standard web-browser. Refer to Section 23 09 54 for requirements. This contractor shall integrate the controlling devices and the CCS together.
  2. Local Supervisory LAN: The Local Supervisory LAN shall be an Ethernet-based, 100 Mbps LAN connecting Primary Control LANs and OWSs. The LAN serves as the inter-BC gateway and OWS-to-BC gateway and communications path. Contractor shall provide this as a dedicated LAN for the control system. LAN shall be IEEE 802.3 Ethernet over Fiber or Category 5 cable with switches and routers that support 100 Mbps throughput.  
Power-line carrier communication shall not be acceptable for communications. The physical media will be that installed for the IT infrastructure of the facility and as such network drops will be provided under that scope of work to facilitate work of this scope. This network will be 100 Mbps and therefore all network interface cards shall support that speed. The higher level layers of this network shall be BACnet as described below:
    - a. BACnet Supervisory LAN: Shall be BACnet/IP as defined in the BACnet standard, and shall share a common network number for the Ethernet backbone, as defined in the BACnet standard. Point/Object naming conventions are specified in 23 09 55 - Part III.
  3. Controlling LAN: High-speed, peer-to-peer communicating LAN used to connect AACs, ASCs and Building Controllers (BCs) and communicate exclusively control information. Acceptable technologies include:
    - a. Ethernet (IEEE802.3)
    - b. ARCNET (IEEE802.4)
    - c. Communication to/from building controller (BC) and the control system server (CSS) shall utilize standard TCP/IP, BACnet/IP ports (80and/or 47808)
  4. Secondary Controlling LAN : Network used to connect AACs, ASCs or SDs. These can be Master Slave/ Token Passing or polling, in addition to those allowed for Primary Controller LANs. Network speed vs. the number of controllers on the LAN shall be dictated by the response time and trending requirements.
- D. Dynamic Data Access: Any data throughout any level of the network shall be available to and accessible by all other devices, Controllers and OWS, whether directly connected or connected remotely.
- E. Remote Data Access: The system shall support the following methods of remote access to the building data.
1. Browser-based access: A remote user using a standard browser shall be able to access all control system facilities and graphics with proper authentication. DTCC shall maintain continuous network connection. The following paradigms are

acceptable for browser-based access:

- a. Native Internet-based user interface (HTML, Java, XML, etc.) via a standard freely distributed web browser that does not require a Windows client software installation.
- F. The communication speed between the controllers, LAN interface devices, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition. Contractor shall submit guaranteed response times with shop drawings including calculations to support the guarantee. In no case shall delay times between an event, request, or command initiation and its completion be greater than those listed herein. Contractor shall recommend reconfiguring the LAN as necessary to accomplish these performance requirements.:
1. 5 seconds between a Level 1 (critical) alarm occurrence and enunciation at operator workstation.
  2. 10 seconds between a Level 2 alarm occurrence and enunciation at operator workstation.
  3. 20 seconds between and a Level 3-5 alarm occurrence and enunciation at operator workstation.
  4. 10 seconds between an operator command via the operator interface to change a setpoint and the subsequent change in the controller.
  5. 5 seconds between an operator command via the operator interface to start/stop a device and the subsequent command to be received at the controller.
  6. 10 seconds between a change of value or state of an input and it being updated on the operator interface.
  7. 10 seconds between an operator selection of a graphic and it completely painting the screen and updating at least 10 points.
- G. Control Systems Server (CSS): A server class computer(s) that maintains the systems configuration and programming database. This server is located at DTCC data center in a virtual environment and serves as an access point to BAS. It shall hold the backup files of the information downloaded into the individual controllers and as such support uploading and downloading that information directly to/from the controllers. It shall also act as a control information server to non-control system based programs. It shall allow secure multiple-access to the control information. Refer to Section 23 09 52 - BAS Operator Interfaces for its requirements.
- H. The Operator Interface shall provide for overall system supervision, graphical user interface, management report generation, alarm annunciation, and remote monitoring. Refer to Section 23 09 52 - BAS Operator Interfaces.
- I. The BCs, AACs, ASCs, [and SDs] shall monitor, control, and provide the field interface for all points specified. Each BC, AAC, or ASC shall be capable of performing all specified energy management functions, and all DDC functions, independent of other BCs, AACs, or ASCs and operator interface devices as more fully specified in Section 23 09 53 - BAS Field Panels.
- J. Systems Configuration Database: The system architecture shall support maintaining the systems configuration database on the CSS. User tools provided to DTCC shall allow configuring, updating, maintaining, etc. current configurations and settings

whether they are initiated at the server or the end device.

1. Database Schema shall be published and provided to DTCC to facilitate easy access to the data.
  2. Database shall be ODBC compliant.
- K. Interruptions or fault at any point on any Primary Controller LAN shall not interrupt communications between other nodes on the network. If a LAN is severed, two separate networks shall be formed and communications within each network shall continue uninterrupted.
- L. All line drivers, signal boosters, and signal conditioners etc. shall be provided as necessary for proper data communication.
- M. Anytime any controller's database or program is changed in the field, the controller shall be capable of automatically uploading the new data to the CSS.

#### 1.12 WARRANTY MAINTENANCE

- A. Contractor shall warrant all products and labor for a period of (insert warranty period) after Substantial Completion.
- B. DTCC reserves the right to make changes to the BAS during the warranty period. Such changes do not constitute a waiver of warranty. The Contractor shall warrant parts and installation work regardless of any such changes made by the State, unless the Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the BAS.
- C. At no cost to DTCC, during the warranty period, the Contractor shall provide maintenance services for software and hardware components as specified below:
1. Maintenance services shall be provided for all devices and hardware specified in sections 23 09 51 through 23 09 59. Service all equipment per the manufacturer's recommendations. All devices shall be calibrated within the last month of the warranty period.
  2. Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired following notification by DTCC to the Contractor.
    - a. Response by telephone to any request for service shall be provided within two (2) hours of the State's initial telephone request for service.
    - b. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to be serviced, shall be dispatched to the State's site within eight (8) hours of DTCC initial telephone request for such services, as specified.
  3. Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by DTCC to the Contractor.
    - a. Response by telephone to any request for service shall be provided within

eight (8) working hours (contractor specified 40 hr per week normal working period) of DTCC initial telephone request for service.

- b. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware and software technician, trained in the system to DTCC initial telephone request for such services, as specified.
4. Telephonic Request for Service: Contractor shall specify a maximum of three telephone numbers for DTCC to call in the event of a need for service. At least one of the lines shall be attended at any given time at all times. Alternatively, pagers can be used for technicians trained in system to be serviced. One of the three paged technicians shall respond to every call within 15 minutes.
5. Technical Support: Contractor shall provide technical support by telephone throughout the warranty period.
6. Preventive maintenance shall be provided throughout the warranty period in accordance with the hardware component manufacturer's requirements.

#### 1.13 DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons during shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

#### 1.14 LISTING AND LABELING

- A. The BAS and components shall be listed by Underwriters Laboratories (UL 916) as an Energy Management System.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Automated Logic by Radius Systems
- B. Johnson Controls by Modern Controls
- C. Substitutions: See Section 01 60 00 - Product Requirements

#### 2.02 MATERIALS AND EQUIPMENT

- A. Materials shall be new, the best of their respective kinds without imperfections or blemishes and shall not be damaged in any way. Used equipment shall not be used in any way for the permanent installation except where drawings or specs specifically allow existing materials to remain in place.

#### 2.03 UNIFORMITY

- A. To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.02 INSTALLATION OF CONTROL SYSTEMS

- A. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
- B. Network Connectivity: The BAS contractor shall provide two network connections with Cat-6 cables from the Building Controller to the State's IT network.
  - 1. The BAS contractor shall terminate one end of the two Cat-6 cables at or around the State's patch panel and make connections to the State's switch with green patch cables, following the instruction of the DFM's IT personnel.
  - 2. The BAS contractor shall terminate the other end of the two Cat-6 cables near or within the building controller cabinet with dual RJ-45 terminal box and make connection of one cable to the building controller. Note: the second connection is for on-site operator interface through a mobile computer. Exposed cable shall be protected by conduit or wire mold.
  - 3. The BAS contractor shall label the two network connections BAC-1 and BAC-2 on both ends.
- C. Refer to additional requirements in other sections of this specification.

### 3.03 SURGE PROTECTION

- A. The Contractor shall furnish and install any power supply surge protection, filters, etc. as necessary for proper operation and protection of all BCs, AAC/ASCS operator interfaces, printers, routers, gateways and other hardware and interface devices. All equipment shall be capable of handling voltage variations 10% above or below measured nominal value, with no effect on hardware, software, communications, and data storage.

### 3.04 DEMOLITION AND REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Contractor shall assume that existing equipment that specifically is indicated to be reused is in good condition and is operable. Contractor, during the course of work, shall inspect these devices and determine if any devices are in need of replacement or repair. Contractor shall prepare an itemized list of suggested repairs/replacement. This repair/replacement will be at the discretion of DTCC and will be accomplished by expanding this contract.
- B. Existing wire, conduit, and control panel cabinets may be reused at DTCC discretion, but only if such materials or equipment comply with the applicable specification for new materials and equipment. Such materials shall not be reused if visibly damaged or otherwise unsuitable for the intended service.
- C. Where such materials are reused, the contractor's shop drawings shall reflect the existing wiring designation. If existing labeling is illegible or otherwise does not comply with the applicable specification for labeling, wiring runs shall be relabeled in accordance with the requirements specified elsewhere.

- D. Existing valves and dampers and their operators may be reused only when preapproved by DTCC. Contractor shall lubricate all damper linkages of dampers being controlled under this project.
- E. Other materials and equipment not specifically mentioned herein may be reused only if specifically allowed by indications on the drawings.
- F. For HVAC systems which are indicated to receive a new BAS, all existing materials and equipment associated with the existing pneumatic controls and EMCS shall be removed. Existing materials and equipment to be removed shall be removed subject to the requirements in paragraph "Sequence of Work".

### 3.05 SEQUENCE OF WORK For Existing Systems Conversion

- A. General: All work involving changeover of control functions from existing pneumatic control system to the new DDC BAS shall be performed in accordance with the following sequence in order to minimize the duration of equipment outages. The following descriptions are intended to indicate the sequence in which the work shall be performed, not to define fully the scope of the work.
- B. Install operator's terminal, peripherals, graphic software, and LAN prior to placing any equipment under the control of the new BAS.
- C. Work which requires shutting down a pump motor, fan motor, or chiller shall be considered a utility shutdown and shall be subject to the restrictions specified in Division 0.1
- D. The following sequence applies to an individually controlled HVAC subsystem, such as an air handling unit. Only one such system shall be placed under manual control (as described below) at any given time.
  - 1. Install controllers adjacent to (or within) existing control panel. Programming shall be complete (except for loading and debugging) prior to installation. Install all field devices, which do not require interruption of the existing control system.
  - 2. Install all conduit, wiring, and pneumatic tubing which does not require interruption of the existing control system.
  - 3. Provide temporary variable pressure type hand pumps at each pneumatically controlled output, for temporary use by DTCC maintenance and operation contractor personnel. Schedule this step at least 48 hours in advance with the Building Engineer.
  - 4. Remove existing controls including wiring, conduit, and tubing (except materials to be reused in accordance with provisions specified elsewhere) which must be removed to facilitate installation of new BAS materials and equipment.
  - 5. Remove existing digital control system points (if applicable). Install and calibrate remainder of new BAS materials and equipment for this subsystem. Load controller software. Connect controller(s) to LAN.
  - 6. Perform all field testing and calibration that does not require connection of permanent pneumatic outputs.
  - 7. Remove temporary hand pumps and install permanent pneumatic output connections. Place the system under the control of the new DDC/BAS equipment.



Conclude field testing and submit field testing report prior to placing the next subsystem under temporary manual control. DTCC shall be given a password with a priority level that allows monitoring (but not control until notification of substantial completion has been approved).

8. Remove remaining existing pneumatic and digital control system materials and equipment (except materials to be reused in accordance with provisions specified elsewhere). All existing digital controls equipment for those subsystems that have not yet been converted shall remain intact, on-line, and fully functional.
9. Schedule work in DTCC's occupied spaces 3 days in advance with DTCC's representative.

### 3.06 CONTROL POWER SOURCE AND SUPPLY

- A. Section 23 09 50 Contractor shall extend all power source wiring required for operation of all equipment and devices provided under Sections 23 09 50 through 23 09 55 and Sequences of Operation.
- B. General requirements for obtaining power include the following:
  1. Obtain power from a source that feeds the equipment being controlled such that both the control component and the equipment are powered from the same panel. Where equipment is powered from a 460V source, obtain power from the electrically most proximate 120v source fed from a common origin.
  2. Where control equipment is located inside a new equipment enclosure, coordinate with the equipment manufacturer and feed the control with the same source as the equipment. If the equipment's control transformer is large enough and of the correct voltage to supply the controls it may be used. If the equipment's control transformer is not large enough or of the correct voltage to supply the controls provide separate transformer
  3. Where a controller controls multiple systems on varying levels of power reliability (normal, emergency, and/or interruptible), the controller shall be powered by the highest level of reliability served. Furthermore, the controller in that condition shall monitor each power type served to determine so logic can assess whether a failure is due to a power loss and respond appropriately. A three-phase monitor into a digital input shall suffice as power monitoring.
  4. Standalone Functionality: Refer to Section 23 09 53.

### 3.07 BAS STARTUP, COMMISSIONING AND TRAINING

- A. Refer to Section 23 09 59

### 3.08 SEQUENCE OF OPERATION

- A. Refer to Section 23 09 58 - Sequences of Operation

END OF SECTION 23 09 50

**SECTION 27 05 00**

**TELECOMMUNICATIONS PATHWAYS AND SPACES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Telecommunications Room Build out
- B. Pathways for Telecommunications Systems
- C. Grounding and Bonding for Telecommunications

**1.2 REFERENCES**

- A. Industry Codes, Standards and Methods shall be observed, including the following:
  - 1. ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
  - 2. ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
  - 3. ANSI/TIA-568-C.2: Balanced Twisted Pair Cabling and Components Standard
  - 4. ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standard
  - 5. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
  - 6. ANSI/TIA-570-B: Residential Telecommunications Cabling Standard
  - 7. ANSI/TIA-606-A: Administration Standard for Telecommunications Infrastructure of Commercial Buildings
  - 8. ANSI/TIA-607-C: Commercial Building Grounding and Bonding Requirements for Telecommunications
  - 9. ANSI/TIA-758-A: Customer-Owned Outside Plant Telecommunications Cabling Standard
  - 10. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition
  - 11. National Fire Protection Agency (NFPA-70): National Electrical Code (NEC)
- B. Comply with all local, state and federal codes for telecommunications installations.

**1.3 SYSTEM DESCRIPTION**

- A. Design Requirements
  - 1. All systems and equipment must comply with the Delaware State-Wide Information Technology and Architecture Standards, Latest Version.

2. Contractor shall outfit all telecom rooms according to T Drawings. Racks and other termination and distribution fields shall be installed according to manufacturer's guidelines and industry standards.
3. TR and TER layouts shall be approved by school Technology personnel prior to installation of cabling, pathways or termination hardware.

B. Performance Requirements

1. Materials and equipment will be installed in an orderly and precise manner. Clearances between equipment will prevent incidental damage or unsafe conditions.
2. Equipment shall provide proper support and housing of all intended active and non-active components.
3. Refer to Telecom Room Details for precise location of equipment and termination fields.

1.4 SUBMITTALS

A. Product Data

1. Provide product data for all equipment listed in Part 2
2. Equipment data must be submitted in a single package and clearly indicated for efficient review. (by specifications section) Equipment submittals not clearly called out will be rejected without question at the contractor's expense for resubmittal.
3. Product data must be approved by designer and owner prior to purchase and installation of equipment.

B. Shop Drawings

1. Provide scaled drawings to show proposed equipment locations, clearances and administrative labeling of Telecom Rooms and equipment. All fields, racks and cabinets shall be methodically documented and permanently labeled agreed upon by school district.
2. Shop drawings must be approved by the designer and owner prior to purchase and installation of any equipment.

C. As-Built Drawings

1. Contractor shall upon completion of the project, provide a complete set of As-Built drawings. These drawings shall identify room numbers and outlet identification numbers for all low voltage cabling systems. Drawings should also include all IDF and MDF locations with a detailed layout of all racks, patch panels, trays, and wall fields.
2. Additional project information shall include Reline Details of all horizontal and backbone cable routes and pathways.
3. As-Built shall be submitted in electronic CAD format and in hardcopy at the end of the project.

## 1.5 QUALITY ASSURANCE

### A. Regulatory Requirements

1. All equipment shall be installed in a neat and professional manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the school district. Equipment and materials shall be of the quality and manufacturer indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

### B. Substitutions

1. Conditions for consideration of “Or Equal” Products: Where products are specified by name and accompanied by the term “or equal”, the proposed “or equal” product will be considered when the following conditions are satisfied.
  - a. If all the following conditions are not satisfied, Design Consultant will return requests without action, except to record noncompliance with these requirements
  - b. Proposed product does not require extensive revisions to the Contract Documents.
  - c. With the exception of the product name or number and manufacturer’s name, proposed product conforms with requirements indicated on the Drawings and in the Specifications in every respect and will produce indicated results.
  - d. Proposed product is fully documented and properly submitted.
  - e. Proposed product has received necessary approvals of authorities having jurisdiction.
  - f. Proposed product is compatible with and has been coordinated with other portions of the Work.
  - g. Proposed product provides specified warranty.
2. If proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
3. Submission is accompanied with detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Submission is accompanied with a list of similar installations for completed projects with project names and addresses and names and addresses of design consultants and authorities, if requested.
5. Submission is accompanied with proposed product’s Manufacturer signed written statement on Manufacturer’s letterhead, certifying that manufacturer complies with requirements in the Contract Documents.

## 1.6 WARRANTY

- A. Warranty: Installer must provide manufacturer's warranty without cost to the owner during that time period, including materials, hourly costs, etc.,.
- B. Installer's warranty shall guarantee workmanship for a period of one year, during which time any deficiency in installation shall be repaired or replaced at no additional cost to the school district. Contractor must respond within 2 business days of written notification.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Distribution Racks and Cabinets

- 1. Floor Mounted Free Standing 2 Post Racks
  - a. Hubbell HPW84RR19D 84" X 6" Equipment Rack with
    - i. Hubbell HC219CE3N 2U Horizontal Manager
    - ii. Hubbell XS1010 Vertical Cable Manager
  - b. Or approved equal from Cooper B-Line, Ortronics, Systimax or Leviton.
- 2. Floor Mounted Free Standing 4 Post Racks
  - a. Four post aluminum frame with EIA rails
  - b. 45 Rack Units
  - c. Black
  - d. Similar to Ortronics OR-MM67SVR or approved equivalent.
- 3. Floor Mounted Equipment Cabinet
  - a. The cabinet frame shall be constructed of four cold rolled steel components – top, bottom, left and right welded to form a self-supporting framework. The side members shall be fabricated from 16ga cold rolled steel. The top and bottom shall be fabricated from 14ga cold rolled steel. The vertical uprights shall have integral cable management channels with provisions for hook and loop or traditional cable ties. The frame shall be bolted to the floor, and side by side to other frames.
  - b. The side covers shall be constructed of 19ga cold rolled steel with double bent flanges along the entire perimeter. The side covers shall lift off easily via grip handles assembled to the covers. The side cover shall have clusters of rectangular perforation to accommodate ventilation for equipment providing greater than 100 sq. in. of ventilation.
  - c. The front door shall be a window door assembled to the frame via spring-loaded hinges at the top and bottom. The door shall be locking with a unique operator's key. The operator's key shall operate the front door only. The latch shall be flush to the door. The window shall be a .125" acrylic panel secured to a reinforced steel frame.
  - d. The rear door shall be a steel door assembled to the frame via spring-loaded hinges at the top and bottom. The door shall be locking with a unique service personnel key. The service personnel key shall operate both the rear and front doors. The latch shall

be push button operated. The rear door shall be reinforced and have a cluster of rectangular perforations for ventilation.

- e. The top shall have a removable panel in the center, designed to be replaced with a cooling fan, and six 3" diameter cable entry knockouts; three along each side to route cables directly into vertical cable organizers minimizing the number of bends to the cables.
  - f. The bottom panel shall be similarly configured with 6 knockout locations. The cabinet bottom shall also be provided with holes for securing the cabinet to the floor.
  - g. The top cover shall accept the mounting of a 250 CFM cooling fan.
  - h. The cabinet shall be pre-configured for 19" mounting with universal hole spacing per EIA 310 D. The cabinet shall feature three sets of rails, front, center, and rear. The front set of rails shall be 20 rack positions high, from the bottom of the cabinet. The rear and center rails shall be the full internal height. The recess of all three sets of rails shall be adjustable forward and back. The rails shall be tapped for a #10-32 screw. The center rails shall be formed in a 'C' profile, 3" deep tapped on both the front and rear flanges so as to provide the functionality of an open frame rack. The front and rear rails shall be an L shape.
  - i. The entire enclosure shall be finished with a durable polyurethane powder coat – medium texture and shall be available in black.
- 4. All racks and cabinets shall be capable of supporting the weight and space of existing and proposed equipment. 30% growth capacity shall be provided in addition to detailed requirements.
  - 5. Racks, cabinets and other termination equipment shall be properly secured to floor with appropriate anchors and bonded to Telecommunications Grounding System.
  - 6. Unit shall be similar to Ortronics OR-DCC422846-00002 or approved equivalent.
  - 7. Provide (1) 8-port transient surge protection strip for each TR and per rack/cabinet in the TER and TRs.

## B. Cable Management

- 1. Horizontal Cable Management
  - a. Horizontal wire management panels are required for patch panels in certain racks. (See drawings for rack diagrams.)
  - b. Horizontal cable management shall occupy 1 or 2 rack units, as shown on T Drawings.
  - c. Similar to OR-MM6HMF1RU or approved equivalent
- 2. Vertical Cable Management
  - a. Vertical Cable management shall be provided for all racks. Provide 2 for each rack or cabinet.
  - b. Cable management shall be – Ortronics OR-60400510, or approved equivalent.

C. Wiremesh Cable Tray

1. Cablofil CF 54/3300
2. Cablofil CF 105/300

D. Ladder-Type Aluminum Cable Tray (Ladder Rack)

1. All TR and TER locations shall receive ladder-rack style cable tray as shown in T-series drawings for cable distribution.
2. Class 5160 or Chatsworth "TELCO-Style Cable Runway," 12-inch ladder rack from racks/cabinets from corridor or other wire routing space where indicated on drawings.

E. Conduit

1. In-wall conduit shall be provided for work in new areas. Refer to T Drawings for conduit details.
2. Conduit bend radii shall follow current ANSI/TIA standards for telecommunications.
3. Refer to T drawings for locations and sizes of all sleeves for telecommunications.

F. Gang Boxes

1. In-wall Gangable Gang Boxes for low voltage:
  - a. Hubbell HBL985 Two Gang Box
  - b. Hubbell HBL986 Three Gang Box
  - c. Hubbell HBL989 Low Voltage Partition

G. Surface Mounted Raceway (SMR)

1. Surface mounted split channel raceway for power and data - Wiremold 4000
  - a. Coordinate all Wiremold for telecom equipment with electrical installer.
  - b. Provide associated colored connectors (see 271000) and faceplates per manufacturer's recommendations for telecommunications.
  - c. Coordinate color and finish with architect prior to installation

H. Floor Boxes and Poke-through Device

1. Small Capacity In-floor box
  - a. Coordinate all floor boxes and poke-through devices for telecom equipment with electrical installer.
  - b. Floor box shall meet latest UL standards for scrub water resistance
  - c. Four-Compartment Combination Box similar to Wiremold RBF4 or Wiremold RFB6

- d. Top of box shall allow for matching floor finish insert and be constructed of metal
  - e. Provide all brackets and accessories for proper telecommunications installation.
- 2. Large Capacity In-floor box
  - a. Wiremold Evolution Series EFB6S with flush mounted cover.
- 3. Poke through
  - a. Unit shall be similar to Wiremold Evolution Series with 5 gangs.
- I. Distribution Backboard
  - 1. Plywood
    - a.  $\frac{3}{4}$ " AC-grade plywood shall be provided as shown on T drawing details to line the walls within the TR. The plywood should be provided in 4' x 8' sheets.
    - b. Plywood shall be void free and painted on all sides with two coats of fire-resistant paint.
- J. Electrical Protection for Telecommunications
  - 1. Telecommunications Main Grounding Busbar (TMGB) and Telecommunications Grounding Busbar (TGB)
    - a. Provide one TMGB in the Telecommunications Equipment Room as shown on T Drawings.
    - b. Provide a TGB in every Telecommunications Room and distribution cabinet location as shown on T Drawings.
    - c. The telecom grounding and bonding system shall be bonded to the main electrical ground for the facility.
- K. UPS Equipment
  - 1. Tripplite SMART3000RM2UN
  - 2. Tripplite SU2200RTXLCDN
- L. Rack mounted power strip
  - 1. Provide 8 port transient, surge protection strip (UL Listed) for each rack or cabinet.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Site Verification of Conditions
  - 1. Contractor shall ensure that sufficient space has been allocated for the installation of all equipment per T Drawings prior to Installation. Clearances and existing equipment



should be taken into consideration. If insufficient space exists, the Design consultant should be notified in writing, before proceeding with Installation.

### 3.2 INSTALLATION

#### A. Distribution Racks and Cabinets

1. Racks shall be assembled such that mounting rails are exactly perpendicular to the base.
2. Racks shall be secured to the floor using appropriate anchors.
3. Racks shall be grounded to the TGB or appropriate building ground using a minimum #6 grounding wire.

#### B. Distribution Backboard

1. Securely fasten backboard to wall-framing members to ensure it can support attached equipment.
2. Mount plywood on all available areas where telecommunications equipment may be located.
3. Refer to T Drawings for minimum coverage.

#### C. Ladder Rack and Cable Tray

1. Ladder rack and cable tray shall be properly secured using manufacturer recommended anchors and connectors.
2. Ladder rack and cable tray shall be routed according to T Drawing floor plans.
3. Ladder rack and cable tray shall be bonded to ground according to TIA/EIA 607.

#### D. Firestop

1. Provide re-enterable, non-hardening, intumescent putty, rated for floors or wall, UL approved assembly, with approved packing material for fire stopping inside building cable penetrations thru conduits sleeves.
2. The material used for sealing all openings shall have a fire rating equal to or greater than the floor ceiling, wall or partition material.

#### E. Sleeves and openings

1. The telecommunications contractor shall provide sleeves through all walls and floors to protect cabling and or raceways installed as part of the telecommunications system. All sleeves shall extend through the respective wall or partition and finish with a connector protective bushing.
2. Sleeves through all fire rated structures shall have appropriate fire stop system.

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## SECTION 27 10 00

### STRUCTURED CABLING

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Local Area Network (LAN) Cabling
- B. Telephone Cabling
- C. Termination Equipment for Telecommunications
- D. Faceplates and Outlets
- E. A/V Cabling

##### 1.2 DEFINITIONS

- A. "Backbone Cabling" refers to telecommunications cabling that provides interconnections between telecommunications rooms, equipment rooms, and entrance facilities.
- B. "Communications Network Outlet (CNO)" refers to a collection of one or more mechanical cable termination device for horizontal cable in the work area.
- C. "Drop" refers to the vertical transition to a location of one or more CNOs.
- D. "Horizontal Cabling" refers to the cabling between and including the work area communications network outlet and the horizontal cross-connect in the telecommunications room.
- E. "Jack" refers to a female-style telecommunication receptacle.
- F. "Telecom Room (TR)" refers to an enclosed space for housing telecommunications equipment, cable terminations, and cross-connects. The room is the recognized cross-connect between the backbone or trunk cabling and horizontal cabling.
- G. "Telecom Equipment Room (TER)" refers to a centralized space for telecommunications equipment that serves the occupants of the building, usually containing the headend equipment for the distribution systems found in the building.

##### 1.3 REFERENCES

- A. Industry Codes, Standards and Methods shall be observed, including the following:
  - 1. ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
  - 2. ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
  - 3. ANSI/TIA-568-C.2: Balanced Twisted Pair Cabling and Components Standard
  - 4. ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standard
  - 5. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
  - 6. ANSI/TIA-570-B: Residential Telecommunications Cabling Standard
  - 7. ANSI/TIA-606-A: Administration Standard for Telecommunications Infrastructure of Commercial Buildings
  - 8. ANSI/TIA-607-C: Commercial Building Grounding and Bonding Requirements for Telecommunications
  - 9. ANSI/TIA-758-A: Customer-Owned Outside Plant Telecommunications Cabling Standard
  - 10. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition
  - 11. National Fire Protection Agency (NFPA-70): National Electrical Code (NEC)
- B. Comply with all local, state and federal codes for telecommunications installations.

#### 1.4 SYSTEM DESCRIPTION

##### A. Design Requirements

1. All systems and equipment must comply with the Delaware State-Wide Information Technology and Architecture Standards, Latest Version.
2. LAN and Telephone Distribution:
  - a. Provide labor, materials, equipment, services and operations required for complete installation of LAN compatible with:
    - i. Ethernet 10Base-SX
    - ii. Ethernet 100Base-FX
    - iii. Ethernet 1000Base-SX
    - iv. Ethernet 1000Base-LX
    - v. Ethernet 10GBase-S
    - vi. Ethernet 10Base-LX4
    - vii. Ethernet 10GBase-L
    - viii. Ethernet 10GBase-LRM
    - ix. Fibre Channel 100-MX-SN-I
    - x. Fibre Channel 100-SM-LC-L
    - xi. Fibre Channel 200-MX-SN-I
    - xii. Fibre Channel 200-SM-LC-L
    - xiii. Fibre Channel 400-MX-SN-I
    - xiv. Fibre Channel 400-SM-LC-L
    - xv. Fibre Channel 1200-MX-SN-I
    - xvi. Fibre Channel 1200-SM-LL-L
    - xvii. FDDI PMD ANSI X3.166
    - xviii. FDDI SMF-PMD ANSI X3.184
  - b. All wiring including copper and fiber optic employs a star topology.
    - i. Category 6 UTP wiring terminates on Category 6 RJ-45 jack at workstation and on Category 6 rack-mounted patch panel in telecommunications room. Connections wired per ANSI/TIA-568A.
    - ii. Multi-strand composite fiber optic cable connects distribution racks between telecommunications rooms and terminates on rack-mounted fiber optic patch panel.

- c. Network cables routed from distribution racks throughout building as shown on T-Drawings. Drop to outlet installed in conduit and wall box, or dual-channel surface mounted raceway to communications outlet in classrooms, offices, or other locations indicated on T-Drawings.
    - i. Refer to notes on each drawing to determine exact installation methods.
    - ii. Note and record all cable lengths to the nearest foot.
    - iii. Replace any cable exceeding 90 meters (295 feet) and route to reduce length to a minimum of 90 meters. Complete all cable rerouting for compliance at no additional cost to School district.
    - iv. Identify to Design consultant prior to installation of any cables that cannot be reduced to 90 meters or less in total length (rise and run).
    - v. Strictly adhere to most current version of ANSI/TIA Telecommunications cabling standards.
    - vi. Unless otherwise noted on T-Drawings, provide ladder-type cable tray from corridor to distribution racks and termination fields in telecommunication rooms.
    - vii. Install “waterfall” device providing sweep from cable tray to data rack/cabinet and other vertical transitions.
  - d. Data and Telephone outlets: Category 6 rated RJ-45 type connectors with all four copper pairs terminated and tested in accordance with the 568B wiring standard.
  - e. Fiber Optic Horizontal and Backbone Cables: Terminate on panels in each rack and connectors with ceramic sleeves. Terminate and test all strands unless otherwise noted.
  - f. Permanently identify and label all cables and termination devices, at distribution rack and workstation in accordance with ANSI TIA 606 Standard or as agreed by Design consultant and school district.
  - g. Remove and replace any cables failing to meet end-to-end testing requirements; do not abandon cable in place. All cable shall be terminated at both ends, unless noted in T-Drawings.
- B. Performance Requirements
- 1. Comply with applicable requirements in Local, State and Federal Codes, ANSI/TIA Standards, and BICSI methodology.

## 1.5 SUBMITTALS

- A. Comply with requirements of Division 0 and Division 1 - Submittals and as modified below.
- B. Product Data: Submit manufacturer’s product literature, technical specifications and similar information for the following items demonstrating compliance with the specified requirements.
  - 1. Communications outlets, faceplates, and accessories.
  - 2. Fiber optic cable, patch cables and terminations.

3. Copper cable, patch cables and termination devices.
  4. Inner duct and accessories.
  5. Rack configurations and wiring diagrams.
  6. Network cabling test equipment and process (routines).
  7. Equipment Racks
  8. Outlets
- C. Samples:
1. Provide samples of outlets and assemblies as described below, prior to installation, for approval by designer.
  2. Telecommunications outlets – Submit samples of telecommunications outlets to be provided including following components and characteristics:
    - a. Flush mounted and Raceway outlets – Completely assembled faceplate and wall box with each type of outlet to be mounted in faceplate, including blank covers, dust covers, labeling field, cabling, and adapter plates and bezels required.
    - b. Sample characteristics:
      - i. Provide all components in colors selected by Design consultant.
      - ii. Provide multiple outlet samples where required to accurately represent range of outlets to be provided.
- D. Shop Drawings
1. The Contractor shall submit shop drawings of all systems showing major components of the systems. Submit wiring diagrams showing connections for all systems and equipment.
- E. Quality Control Submittal
1. Test Reports: Submit complete sample test data and reports with exact labels used on cables, patch panels and faceplates.
  2. Certificates
    - a. Manufacturer Certification: Submit certification from manufacturer of products to be installed under this contract certifying that Installer is authorized by manufacturer to install specified products.
    - b. Installer Experience Listing: Submit list of at least 5 completed projects as specified below in “Quality Assurance – Qualifications – Installer.”
- F. Contract Closeout Submittal: Comply with requirements of Division 0, including submission of operating and maintenance instructions as item in “Operation and Maintenance Data” manual described in that Section.

#### 1.6 QUALITY ASSURANCE

- A. All Work shall be installed in a first class, neat and workmanlike manner by skilled Technicians. The quality of the workmanship shall be subject to inspection and approval by authorized school district personnel. Any work found to be of inferior quality and/or workmanship shall be replaced and/or reworked until the approval of school district is obtained.
- B. Installer Qualifications: Qualified to cable, terminate and test data network cabling system specified in this Section, certified by manufacturer of products to be installed, and

completed at least 5 computer network installations of similar size, nature and complexity as specified for this project.

- C. Conditions for Consideration of "Or Equal" Products: Where products are specified by name and accompanied by the term "or equal", the proposed "or equal" product will be considered when the following conditions are satisfied. If all the following conditions are not satisfied, Design Consultant will return requests without action, except to record noncompliance with these requirements:
1. Proposed product does not require extensive revisions to the Contract Documents.
  2. With the exception of the product name or number and manufacturer's name, proposed product conforms with requirements indicated on the Drawings and in the Specifications in every respect and will produce indicated results.
  3. Proposed product is fully documented and properly submitted.
  4. Proposed product has received necessary approvals of authorities having jurisdiction.
  5. Proposed product is compatible with AND has been coordinated with other portions of the Work.
  6. Proposed product provides specified warranty.
  7. If proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
  8. Submission is accompanied with detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  9. Submission is accompanied with a list of similar installations for completed projects with project names and addresses and names and addresses of design consultants and authorities, if requested.
  10. Submission is accompanied with proposed product's Manufacturer signed written statement on Manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents.

#### 1.7 WARRANTY

- A. Installer's Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.
- B. A fifteen (15) year Extended Product Warranty and Systems Assurance Warranty for this wiring system shall be provided by the Manufacturer as follows:
1. Extended Product Warranty: The Extended Product Warranty shall ensure against product and workmanship defects, that all approved cabling components exceed the specifications of ANSI/TIA 568B and Addenda for fiber link/channels and copper components, for a fifteen (15) year period. The warranty shall apply to all passive components, including both cable and connecting hardware as a combined system. Any claims cover replacement costs on any defective product, both material and labor. Extended warranties beyond fifteen (15) years will be considered.
  2. System Assurance: The System Assurance shall cover the failure of the wiring system to support the application which it was designed to support as well as additional application(s) introduced in the future by recognized standards or user forums that use the ANSI/TIA 568B component and link/channel specifications for cabling, for a fifteen (15) year period.



3. System Certification: Upon successful completion of the installation and subsequent inspection, the School district shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Vendor (or vendor's subcontractor) must be Hubble, Beldin, or ICC certified; and provide current company certification document. Vendor must explicitly identify all cabling subcontractors (company name, address, phone, primary contact), if any.
- B. Vendor (and/or vendor's subcontractor) must follow latest Delaware State-Wide Information Technology and Architecture Standards; Structured Cabling System Standards and Specifications for State-Managed Facilities.  
<https://webfiles.dti.delaware.gov/pdfs/pp/CablingAndWiringStandard.pdf>
- C. All data structured cabling must be certified using a Fluke DTS-5000, Fluke DSX-8000, or DTCC approved equivalent, at the following data rates: CAT6 - 1 Gbps, CAT6A - 10 Gbps.
- D. All cabling certification equipment must be Intertek conformant. Vendor must provide Intertek conformance website link for all certification equipment used.  
<http://www.intertek.com/ETL-Verified-Directory/Cabling-Products/>
- E. Vendor must provide copy of latest manufacturer's (or manufacturer's authorized servicing company) cabling certification equipment calibration document, not to exceed more than one year in age prior to date of proposal.
- F. All materials shall be new and unused except as noted in T-series Drawings.
- G. All cables shall be plenum rated
- H. System wiring and equipment installation shall be in accordance with good engineering practices as established by ANSI/TIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.
- I. Velcro straps shall be used for bundling wires. Wires shall be bundled loosely. Permanent cable ties are not acceptable.
- J. Wiring system shall consist of the following:
  1. Accessories and Appurtenances
  2. Cable Management Devices
  3. Fiber Optic Cable and Terminators (as indicated on drawings)
  4. Copper and Fiber Patch cables
  5. Remote Jacks
  6. Termination/Patch Panels
  7. Twisted Pair Data Cables
  8. The Cable Infrastructure Project requires a structured cabling system, or equivalent single-manufacturer solution. The Category 6 portion of the cabling system shall comply with the link and channel performance requirements of ANSI/TIA 568-B.2-1 "Performance Specifications for 4-pair 100 Ohm Category 6 Cabling". The cabling system shall be backed by a 15-Year System Warranty.
  9. The work includes the provision for a complete and operable Local Area Network Building Data System consisting of active and non-active components. The cabling system and all wiring components shall meet and comprise an ANSI/TIA Category 6

Wiring System. With master and remote data equipment the completed system shall provide 1Gbs Fiber Optic Fast Ethernet communications backbone support to the edge switches and Ethernet 1000 BASE-T to the workstation data jacks. The system shall provide such services as computer networking, data transmission, graphics and other multi-media offerings.

10. Provide one home run cable from each data/voice jack to appropriate wiring closet.
11. Cable length of home run cable shall not exceed 90 meters.
12. All Modular jack panels shall be wired to ANSI/TIA 568B

## 2.2 J-HOOKS

- A. Cooper B-Line BCM-21, 23 or 64.
  1. Provide in sufficient quantity for 15% future expansion.
  2. Installed no more than 6' apart.
  3. Install in any areas without cable tray above false ceilings.

## 2.3 HORIZONTAL CABLES

- A. Category 6a 100 ohm UTP 23 AWG Wireless cables shall have a distinctive color. Submit for approval from design team.
  1. Hubbell C6ASxx
  2. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- B. Category 6 100 ohm UTP Voice, Data, Wireless and Security cables shall each have a distinctive color. Submit for approval from design team.
  1. Hubbell C6SPxx
  2. Hubbell C6RPxx
  3. Hitachi 30025-8
  4. Hitachi 30024-8
  5. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC

## 2.4 BACKBONE CABLES

- A. Multi-pair Cat 5e Riser Cables
  1. Hitachi 30093-50
  2. Hitachi 30172-100
  3. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- B. SingleMode Fiber Optic Cables
  1. 12 Strand Hitachi 61459
  2. Or approved equal from
    - a. Corning
    - b. Berk-Tek

## 2.5 TERMINATION FIELDS

- A. Category 6a 48-Port Patch Panels. Patch panels shall be segregated for POE switches and non-POE switches.
  - 1. Provide 15% spare capacity
  - 2. Hubbell HP6A48
  - 3. Hubbell Rear Cable Manager
  - 4. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- B. Category 6 48-Port Patch Panels. Patch panels shall be segregated for POE switches and non-POE switches.
  - 1. Provide 15% spare capacity
  - 2. Hubbell P6E48U
  - 3. Hubbell PCBLMGT Rear Cable Manager
  - 4. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- C. Fiber Enclosure
  - 1. Hubbell 2U FCR350SP36R
  - 2. Hubbell 2U FCR350SP54R
  - 3. Hubbell 3U FCR525SPR
  - 4. Hubbell 4U FCR700SP
  - 5. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- D. Fiber Adaptor Panels
  - 1. Hubbell FSPLCDM6AQ
  - 2. Hubbell FSPLCQM6AQ
  - 3. Hubbell FSPLCDS6
  - 4. Hubbell FSPLCQS3
  - 5. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- E. Fiber Connector
  - 1. Hubbell FCLC900K50GM12 50/125um OM4 Aqua
  - 2. Hubbell FCLC900K50GM12 9/125 UPC
  - 3. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- F. 110 Blocks
  - 1. Hubbell 110BLK50FTK5
  - 2. Hubbell 110BLK100FTK5
  - 3. Hubbell 110BLK300FTK5
  - 4. Or approved equal from

- a. Belden
- b. Hubble
- c. ICC

## 2.6 OUTLETS

- A. Category 6a Wireless Jacks
  - 1. Hubbell HJ6Axx (replace xx with specified colors)
  - 2. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- B. Category 6 Voice and Data Jacks
  - 1. Hubbell HXJ6xx (replace xx with specified colors)
  - 2. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- C. Faceplates
  - 1. Hubbell IFP11xx
  - 2. Hubbell IFP12xx
  - 3. Hubbell IFP13xx
  - 4. Hubbell IFP14xx
  - 5. Hubbell IFP16xx
  - 6. Hubbell IFP26xx
  - 7. Hubbell IFP29xx
  - 8. Hubbell IFP212xx
  - 9. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- D. Frames
  - 1. Hubbell ISF2xx
  - 2. Hubbell ISF3xx
  - 3. Hubbell ISF4xx
  - 4. Hubbell ISF6xx
  - 5. Hubbell NS620xx
  - 6. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC

## 2.7 PATCH CORDS

- A. Cat 6a UTP Copper Patch Cords
  - 1. Hubbell HC6Axx03
  - 2. Hubbell HC6Axx05
  - 3. Hubbell HC6Axx07
  - 4. Hubbell HC6Axx010
  - 5. Hubbell HC6Axx15
  - 6. Hubbell HC6Axx20

7. Hubbell HC6Axx25
  8. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- B. Cat 6 UTP Copper Patch Cords
1. Hubbell HC6xx03
  2. Hubbell HC6xx05
  3. Hubbell HC6xx07
  4. Hubbell HC6xx010
  5. Hubbell HC6xx15
  6. Hubbell HC6xx20
  7. Hubbell HC6xx25
  8. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC
- C. Fiber Patch Cords
1. Hitachi Singlemode
  2. Or approved equal from
    - a. Belden
    - b. Hubble
    - c. ICC

## 2.8 A/V CABLING

- A. HDMI
1. Extron Pro Cable
- B. USB
1. Kramer Active USB 3.0
- C. 3.5 MM Audio

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Examine conditions under which telecommunications cabling and equipment and related components are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Design consultant in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected to ensure a safe and timely installation.
1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Design consultant written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
  2. Visit Site to identify and become familiar with existing field conditions and specific requirements of each Site.

3. Verify all dimensions in field and confirm condition of existing hardware to be utilized.
4. Confirm space requirements and physical confines of all work areas to ensure that all materials can be installed in indicated spaces.
5. Confirm all outlet locations and cable pathways and advise Design consultant in writing of any discrepancies or issues in Design described in Contract Documents.

### 3.2 PREPARATION

- A. Protection: Provide adequate protection of equipment and hardware before and after installation.
- B. Existing Communications Services: Ensure all telecommunications systems (voice, video and data) remain operational throughout the project.
  1. Identify any additional telecommunications outlets, circuits, and wiring at the site not shown on T-Drawings and interfering with installation of specified equipment.
  2. Contact local telephone, network and CATV company to identify all circuits providing existing services.
  3. Remove all accessible portions of abandoned communications cabling per NEC 800.52. Tag all communications cabling not terminated at both ends but retained for future use.

### 3.3 INSTALLATION

- A. Provide and install all components necessary to install complete telecommunications cabling and equipment systems, including (but is not limited to) connectors, patch cables, terminators, etc...
  1. Cable runs shall be continuous and unbroken from end to end. Splicing of any Telephone, LAN, or coaxial video distribution cable is prohibited. Horizontal cabling for LAN and telephone shall end in rack-mounted patch panels.
  2. Secure all horizontal cables within ceiling cavities to building structure.
  3. Loosely bundle all cables and support from structure at unequal intervals from 5 to 6 feet with spring steel fasteners and cable clip rated for use with high performance cables where cable tray or other support structure has not been provided as indicated on Drawings. All mounting clips shall be seismic type as per BOCA.
  4. Do not violate manufacturer's recommended loadings. Leave 30% capacity for future use of pathway.
  5. Verify all horizontal cable run lengths prior to installation. Re-distribute horizontal cabling to maintain distance requirements and maintain pathway route accessibility.
  6. Do not support cables from ceiling grid T-Bars, grid wire supports or bridle rings. Do not allow cables to touch ceiling grid.
  7. Do not secure cables with permanent cable ties. Do not tighten cable bundles in such a way as to cause jacket deformation or damage.
  8. Provide a 10-foot service loop in all fiber optical cables to permit future cable splice and repair at all building entrance points and termination points.
  9. Place cables in compliance with ANSI/TIA-568.B standards and BICSI recommended methods.
  10. Tight 90-degree bends are unacceptable and use of plastic "cinch-type" tie-wraps are not permitted, in order to prevent damage to cable jacket and compromise the cable's electrical or optical characteristics.

11. Cable bundles shall be neatly routed with a service loop to provide 10 feet of slack at the cross-connect end and as noted in the T-drawings. Cable bundles shall be secured using only black Velcro cable wraps.
12. 10 feet of service loop shall be provided in the ceiling at each workstation. Contractor shall not secure service loop in coils, but route in such a manner as to minimize EMI.
13. Wireless outlet locations
  - a. Wireless locations shown on T-series drawings shall be installed outside of a faceplate.
  - b. Ceiling shall be marked and as-builts shall reflect the location of all terminated ends and service loops as directed by SCHOOL DISTRICT personnel.
  - c. Cable shall be terminated in a female RJ-45 female jack, and left with a service loop as described in T-series drawings. Cable shall be tested and documented per previous requirements.
  - d. After completion of wireless site survey, outlet shall be re-terminated for connection to Wireless Access Point.

B. Determine allowable cable proximity to other electrical power sources of 480 Volts or less using TIA/EIA-569A "Cabling Pathway Standard" for UTP cable separations from sources of EMI:

1. Minimum separation distance from Power Source at 480 V or less:

CONDITION	<u>&lt; 2kVA</u>	<u>2-5 kV</u>	<u>&gt; 5 kVA</u>
a. Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	6 in.	12 in.	24 in.
b. Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	3 in.	6 in.	12 in.
c. Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to grounded metal conduit pathway	3 in.	6 in.	12 in.
d. Transformers & Elec. Motors	40 in.	40 in.	40 in.
e. Fluorescent Lighting	12 in.	12 in.	12 in.

C. Interior Fiber Optical Cable Installation Requirements

1. Install all interior fiber optic backbone cables in 1-inch plenum-rated inner duct, similar to Pyramid Industries #PLM100(T) where fiber optical cable placed in cable tray or otherwise fully supported in accordance with manufacturer's requirements.
2. Install all outdoor rated communications cables not rated for plenum placement in interior environments in metallic conduit, according to NEC Articles 770 and 800.
3. Install inner duct for fiber optic cabling in all conduits, as necessary for proper support of cables, or where required to assure pull-in tension not exceeding manufacturer's recommendations.

4. Provide pull strings or ropes in all conduit and inner duct used for communications cables.
- D. Cabling System
1. Where not provided as part of the electrical work or the data/voice work, the Contractor shall furnish and install necessary conduit, raceways, pull boxes, outlet boxes and cable to provide a complete system as herein specified. All wiring shall be tested for continuity and freedom of all grounds and short-circuits. All outlet boxes shall be as specified for other wiring devices; size as required by equipment manufacturer.
  2. Cables shall be installed in raceways or EMT, as detailed on the drawings and/or as specified, above non-accessible ceilings, where exposed, and wherever it may be subject to physical damage. Where not provided as part of the electrical work or the data/voice work, the Contractor shall provide a raceway (conduit) from each outlet to above the accessible ceiling. Otherwise, cable shall be installed above accessible suspended tile ceilings and attached to building structure with approved bridle rings or J-hooks, cable is not permitted to rest on ceiling. The cable routes used shall avoid steam lines, power wiring and other utilities that may adversely affect the system's performance or result in damage to the cable. If the routes required place the cable in proximity to these utilities, the cable shall be suitably protected. Under no circumstances shall cable be run in hangers used for pipes or electric conduits nor shall the cable be supported in any way by attachment to these pipes, conduits or ceiling hangers.
  3. During the installation work, improper bending, stretching, twisting, kinking, pinching or any other improper handling must not deform the cable. All cable runs shall contain "S" loops or other means to accommodate expansion and contraction. Coaxial cables shall not bend at any point of installation to a radius of less than ten times the diameter of the cable or less than the value recommended by the cable manufacturer. Cable connected to electronic equipment in the system shall be tagged to show its function and the location of its other end. All labels shall be of durable material and securely fastened to the cable.
  4. All cables shall be fastened securely with suitable hardware so as to avoid sharp bends and to prevent rubbing against sharp corners and in a manner to prevent injury or physical distortion.
  5. Wiring for all wall-mounted equipment shall be concealed in raceway (conduit) from outlet to above removable ceilings, unless noted otherwise.
  6. Wiring installed above removable ceilings shall be installed on bridle rings. No cables shall be installed on roof or exterior of building.
  7. Infrastructure properly terminated on backboard, neatly arranged in orderly fashion and accurately identified.
  8. Equipment cabinet(s) anchored to wall or floor utilizing an approved method.
  9. Install all exposed cabling in surface raceway by Wiremold, Hubbell or Panduit where in-wall conduit has not been provided. Follow all manufacturers' guidelines requirements regarding bending radius and slack. All bends, offsets and fittings shall be appropriately sized to provide 30% capacity after installation.
- E. Install all cable in accordance with National, state and local codes and ANSI/TIA Standards, and BICSI methods.
1. Follow manufacturer's guidelines and requirements for all cable termination.
  2. Install and connect #6 AWG to bond all equipment racks, conduits and cable trays to busbar in each telecom room. Each telecom room shall be interconnected to TER



with #3 AWG bonding backbone to TMGB per Telecommunications Grounding Diagram. It shall be left to licensed electrician to interconnect TMGB with lowest point of building ground. Contractor shall verify TMGB has been bonded to building ground before declaring completion.

- F. Permanently identify all system components following ANSI/TIA-606A “Administration Standard for Commercial Telecommunications Infrastructure” with identification format:
1. Identification: Provide permanent identification labels for outlets, faceplates, patch panels, access panels and entrance facilities.
  2. Each individual cable shall be labeled on both ends of cable terminations regardless of cable intended use. Labels must be machine printed with permanent black ink on laminated white label material. Contractors must check with appropriate school district personnel for appropriate labeling scheme. The intended format and labeling material must be approved by school district Technology Department before labeling begins.

### 3.4 TESTING

- A. LAN and Telephone
1. Upon completion of work, all parts of the telecommunications installation shall be tested by the Telecommunications Contractor and demonstrated free of any defects. Preliminary testing will be permitted but shall not be accepted in lieu of obtaining final test results. Final test results shall be accomplished by the use of proper test equipment for the system being tested.
  2. Re-terminate and re-test any cables or pairs of cables failing end-to-end testing requirements. Replace any faulty cables/pairs or termination devices. Remove all defective cables completely from pathways.
- B. As-Builts
1. Accurate as-built drawings shall be provided in electronic and hard copy format.
    - a. Drawings shall accurately show and describe all cable routing and equipment location in redline format.
    - b. 3 copies of electronic (CAD) drawings shall be distributed on appropriate media: 1 to construction management, 1 to designers and 1 to the school district.
    - c. 3 hard copies of CAD drawings shall be plotted on full size sheets and test results of every installed cable have been given to the construction management for appropriate distribution.

### 3.5 ACCEPTANCE

- A. Contractors work shall be considered complete after the following conditions have been met:
1. Cable installation is complete and all cable runs have been tested and documented to be installed according to specifications and drawings.
  2. A school district Technology representative has successfully tested the “LIVE” system.
  3. All punch list items have been reconciled.
  4. All disturbed ceiling panels, firestopping materials, covers, etc. have been properly reinstalled.
  5. All materials and trash have been removed from the site.

6. A 1-Year Installers warranty has been given to a school district Technology representative.
7. Submit Manufacturers Extended Warranty Application.

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## **SECTION 28 10 00 - INTRUSION DETECTION SYSTEM**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Intrusion Detection cabling
- B. Intrusion Detection sensors
- C. Intrusion Detection end devices
- D. Intrusion Detection headend equipment
- E. Associated power supplies, terminations, equipment, labeling and associated cable performance testing.

#### **1.2 Definitions**

- A. Intrusion Detection system refers to burglar alarm equipment including motion detectors, door contacts, control panels, communication panels, power supplies, expansion modules and associated wiring.

#### **1.3 System Description**

- A. Design Requirements
  - 1. The security control panel shall communicate with the current monitoring agency.
  - 2. The communications format shall be compatible with the monitoring agency to allow reporting of individual point numbers and text and other expanded diagnostic reports.
  - 3. Remote Access: The system shall provide a method for users to remotely access the system and perform all of the functions possible on an operator terminal by LAN (IP). Provide network interface module and Cat 6 cable and associated connections to school's data network.
  - 4. Primary Control Unit: Control unit shall consist of a power supply, signal processing circuitry, tamper circuits, alarm relay and driver circuits. Solid state, modular construction of the control unit must be incorporated for quick and easy servicing.
  - 5. The system shall be installed so that 10 percent future area protection of each zone may be added without compromising system performance in any way and no additional control equipment is necessary.
  - 6. The system shall be continuously supervised by a tamper circuit to prevent defeat by cutting, jumping or shorting to ground one or more transducer lines. When the system is in the armed mode of operation or in the stand-by mode of operation, attempts at tampering will activate a remote trouble unit.
  - 7. All zone controls shall be tamperproof installations so that tampering with a zone control will activate the remote trouble module.

8. The system shall operate from 120 volts, 60 Hz power under normal conditions. In the event of a power interruption, the system will automatically operate off of a self-contained emergency D.C. power source located within the control cabinet. When normal A.C. power is restored, the system shall resume normal operation. Under no circumstance will interruption of A.C. power cause the system to generate false alarms or fail to operate.
9. Arming and disarming shall be controlled by keypads.
10. The system shall include the LCD readout style annunciator sensor zone and every hardwired door zone as indicated on the drawings.
11. A system operating keypad shall be a part of the annunciator. The keypad shall override the main arm/disarm clock.
12. System shall have programmable ENTRY AND EXIT times, and keypads shall sound audible tone during ENTRY AND EXIT.
13. Standby batteries. Quantity as required to support system for specified hours upon loss of power. Note: Security system shall be fed from school's emergency generator power source. It is the responsibility of contractor to coordinate with other trades to fulfill this requirement regardless if shown on contract drawings (electrical drawings).
14. The control panel shall have provision to send a signal to the building's intercom system when armed. The control panel shall have provision to send a different signal to the intercom system when in alarm.
15. When the security alarm system is first armed, a voice warning shall announce, via interior public address speakers, that the alarm system has been armed and continually announce the time the occupants have to leave the building or disarm the system (a maximum of five [5] minutes). If alarm system is disarmed, voice warning shall shut down immediately.
16. All security alarm outputs shall generate a two-minute voice alarm, warning intruder(s) that the police have been notified, using interior public address speakers.
17. All devices shall be individually addressable.
18. DS2e Stoppers (wire guards): Safety Technology International, STI series. Provide for all devices in gym, locker rooms, and other high abuse areas noted on drawings.
19. Interface security system to external digital communicator/dialer, refer to drawing(s) for additional requirements.
20. Panel shall be capable of arming and disarming by a maintained relay contact.
21. Provide labor, materials, equipment, services and operations required for a complete installation an Intrusion Detection System.
  - a. Base panel
  - b. Expansion modules

- c. Keypads
  - d. Annunciators
  - e. Motion Detectors
  - f. Door Contacts
  - g. Communication Modules
  - h. Power Supplies
  - i. Controllers
  - j. Servers
  - k. Application Software
22. All wiring shall be wired according to manufactures specifications.
- a. Refer to notes on each drawing to determine exact installation methods.
  - b. Strictly adhere to most current version of ANSI/TIA Telecommunications cabling standards.
  - c. Permanently identify and label all cables and termination devices, at distribution rack and workstation in accordance with ANSI TIA/EIA-606 Standard or as agreed by Design consultant and Authority.
  - d. Remove and replace any cables failing to meet end-to-end testing requirements; do not abandon cable in place. All cable shall be terminated at both ends, unless noted in T-Drawings.

B. Performance Requirements

- 1. The system shall interface with the Building Control System at the facility.
- 2. The system shall be connected to the lighting control system at the facility
- 3. The system shall produce a signal if the system is breached by an unauthorized user.
- 4. Each sensor shall be individually alarmed.
- 5. The system shall be capable of a minimum of 8 partitions.
- 6. The system shall be capable of being scheduled.
- 7. The system shall be capable of being controlled from the main panel, keypad locations, central station and PC connected to the LAN.
- 8. The intrusion detection system will alert and record movement throughout the facility that is both authorized and unauthorized.
- 9. The systems will be capable of communicating onsite as well as to remote locations.

10. The systems shall be controllable in case of emergency situation.
11. All systems shall operate on dedicated circuits with associated cabling in EMT.
12. Comply with applicable requirements in Local, State and Federal Codes, TIA/EIA Standards, and BICSI methodology.
13. Specified cabling system derived from recommendations in approved telecommunications industry codes, standards and methods, including the following documents:
  - a. Articles 250, 725, 760, 770, 800,810 and 820 of the current National Electrical Code.
  - b. ANSI/TIA/EIA-568-B.1: Commercial Building Telecommunications Cabling Standard Part 1 – General Requirements
  - c. ANSI/TIA/EIA-568-B.2: Commercial Building Telecommunications Cabling Standard Part 2 – Balanced Twisted Pair Cabling Components and subsections.
  - d. ANSI/TIA/EIA-568-B.3: Commercial Building Telecommunications Cabling Standard Part 3 – Optical Fiber Cabling Components
  - e. ANSI/TIA/EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
  - f. ANSI/TIA/EIA-606: Administration Standard for Telecommunications Infrastructure of Commercial Buildings
  - g. ANSI/TIA/EIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
  - h. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition
  - i. National Fire Protection Agency (NFPA-70): National Electrical Code (NEC)

#### 1.4 Submittals

- A. Comply with requirements of Division 0 and Division 1 - Submittals and as modified below.
- B. Product Data: Submit manufacturer's product literature, technical specifications and similar information for the following items demonstrating compliance with the specified requirements.
  1. Motion Detectors, Door Contacts, Keypads
  2. Headend Control Panels and Communications Modules
  3. Power supplies
  4. Copper cable and termination devices.
  5. Inner duct and accessories.

6. Wiring diagrams.
  7. Controllers
  8. Servers
- C. Samples: Provide samples of assemblies and connections as described below, prior to installation, for approval by designer.
1. Intrusion Detection cables and connections – Submit samples of cables and terminations to be provided including following components and characteristics:
    - a. Provide all components in colors selected by Design consultant.
- D. Quality Control Submittal
1. Test Reports: Submit complete sample test data and reports with exact labels used on cables termination fields.
  2. Certificates
    - a. Manufacturer Certification: Submit certification from manufacturer of products to be installed under this contract certifying that Installer is authorized by manufacturer to install specified products.
    - b. Installer Experience Listing: Submit list of at least 5 completed projects as specified below in “Quality Assurance – Qualifications – Installer.”
- E. Contract Closeout Submittal: Comply with requirements of Division 0, including submission of operating and maintenance instructions as item in “Operation and Maintenance Data” manual described in that Section.

#### 1.5 Quality Assurance

- A. All Work shall be installed in a first class, neat and workmanlike manner by skilled Technicians. The quality of the workmanship shall be subject to inspection and approval by authorized school district personnel. Any work found to be of inferior quality and/or workmanship shall be replaced and/or reworked until the approval of school district personnel is obtained.
- B. Qualifications
1. Installer
    - a. Qualified to cable, terminate, program and test Intrusion Detection systems, and associated power wiring specified in this Section and other Division 17000 series specifications, certified by manufacturer of products to be installed, and completed at least 5 installations of similar size, nature and complexity as specified for this project.
- C. Conditions for Consideration of "Or Equal" Products: Where products are specified by name and accompanied by the term "or equal", the proposed "or equal" product will be considered when the following conditions are satisfied. If all the following conditions are not satisfied,



Design Consultant will return requests without action, except to record noncompliance with these requirements:

1. Proposed product does not require extensive revisions to the Contract Documents.
2. With the exception of the product name or number and manufacturer's name, proposed product conforms with requirements indicated on the Drawings and in the Specifications in every respect and will produce indicated results.
3. Proposed product is fully documented and properly submitted.
4. Proposed product has received necessary approvals of authorities having jurisdiction.
5. Proposed product is compatible with AND has been coordinated with other portions of the Work.
6. Proposed product provides specified warranty.
7. If proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
8. Submission is accompanied with detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
9. Submission is accompanied with a list of similar installations for completed projects with project names and addresses and names and addresses of design consultants and authorities, if requested.
10. Submission is accompanied with proposed product's Manufacturer signed written statement on Manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents.

#### 1.6 Warranty

- A. Installer's Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.
- B. Manufacturer warranty coverage for cable systems associated with the Intrusion Detection System

#### 1.7 Training

- A. Installing contractor shall provide a minimum of 8 hours of training on system operation and managements as part of their scope of work.
  1. Additional hours shall be provided on a time and materials basis at the request of the owner.

- B. Installing contractor shall provide a video recording on a standard format DVD to the owner which includes training sessions.

#### 1.8 Operation And Maintenance Manuals

- A. Installing contractor shall provide a minimum of two hardcopy and one electronic copy of all operation and maintenance manuals to the owner at project completion.

### PART 2 - **PRODUCTS**

#### 2.1 Manufacturers

- A. Basis of Design

- 1. Intrusion Detection – Honeywell

#### 2.2 Intrusion Detection

- A. Control Panel

- 1. Honeywell Vista-250 BPE
    - a. Up to 241 zones
    - b. Support for 15 Keypads
    - c. Up to 8 partitions
  - 2. Zone Expander
    - a. Ademco 4208SN
  - 3. Two-Zone Serial Interface Module
    - a. Ademco 4190SN
  - 4. Communicators
    - a. Ademco AlarmNet
  - 5. Keypads
    - a. Ademco 6160
  - 6. Motion Detectors
    - a. Ademco DT7500SN
  - 7. Glass Break Detector
    - a. Ademco FG1625SN
  - 8. Door Contacts
    - a. Ademco 4944SN

- b. Sentrol Surface Mount
  - c. Sentrol Overhead Door
- 9. Power Supplies
  - a. Altronix
  - b. Located in MDF and IDF Rooms as required.
- 10. Cable
  - a. Two Conductor 18 AWG min
  - b. Four Conductor 18 AWG min
- 11. Battery Backup
  - a. Provide properly sized backup battery power supply for full system operation.
- B. Cable/Wiring
  - 1. ALL CABLE/WIRING SHALL BE RUN IN WHITE, EMT CONDUIT. Provide Allied True Color products, or equal. All junction boxes are to be painted white to match conduit. All wiring shall be concealed. No surface metal raceway shall be used unless approved by owner, and if approved, shall be painted to match adjacent wall color.
    - a. General: 18-AWG, 4-wire, unshielded. Provide two (2) cable loops for connection of all devices. Alternate connection of devices between cable loops such that every other device in series is connected to one cable and the other cable is connected to every other device remaining. Cable shall be West Penn Model 25244, or approved equal.
  - 2. Surge Protection: Provide transient surge protection devices on the power feeds for all major components of equipment. This shall include equipment with electronic components such as the control panel. Surge protection devices shall be UL listed, equal to Transtector or Isobar. The devices shall have a 5 nanosecond or less response time for clipping excessive voltage. The surge protection devices shall consist of solid state circuitry, will automatically reset after an operation with no degradation in protective capability and have an indicated light to indicate when the unit is non-operational. Devices shall be direct plug-in type, plug strip type, or hard-wired connection type as applicable.

### PART 3 - EXECUTION

#### 3.1 Examination

- A. Verification of Conditions: Examine conditions under which Intrusion Detection cabling and equipment and related components are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Design consultant in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected to ensure a safe and timely installation.

1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Design consultant written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
2. Visit Site to identify and become familiar with existing field conditions and specific requirements of each Site.
3. Verify all dimensions in field and confirm condition of existing hardware to be utilized.
4. Confirm space requirements and physical confines of all work areas to ensure that all materials can be installed in indicated spaces.
5. Confirm all outlet locations and cable pathways and advise Design consultant in writing of any discrepancies or issues in Design described in Contract Documents.

### 3.2 Preparation

- A. Protection: Provide adequate protection of equipment and hardware before and after installation.
- B. Existing Intrusion Detection Equipment: Ensure all systems remain operational throughout the project.
  1. Identify any circuits and/or wiring at the site not shown on T-Drawings and interfering with installation of specified Equipment.
  2. Remove all accessible portions of abandoned communications cabling per NEC 800.52. Tag all communications cabling not terminated at both ends but retained for future use.

### 3.3 Installation

- A. Provide and install all components necessary to install a complete Intrusion Detection System, including (but is not limited to) connectors, sensors, panels, power supplies, terminators, etc...
  1. Cable runs shall be per manufacturer's recommendations in all cases. Any deviation will result in system rejection.
  2. Secure all horizontal cables within ceiling cavities to building structure.
  3. Loosely bundle all cables and support from structure at unequal intervals from 5 to 6 feet with spring steel fasteners and cable clip rated for use with high performance cables where cable tray or other support structure has not been provided as indicated on Drawings. All mounting clips shall be seismic type as per BOCA.
  4. Do not violate manufacturer's recommended loadings. Leave 30% capacity for future use of pathway.
  5. Do not support cables from ceiling grid T-Bars, grid wire supports or bridle rings. Do not allow cables to touch ceiling grid.

6. Install cables in EMT conduit in all unfinished, exposed areas as shown in Design consultant and Architectural roof plans and/or T-Drawings, unless alternate pathways are noted.
  7. Do not secure cables with permanent cable ties. Do not tighten cable bundles in such a way as to cause jacket deformation
  8. Place cables in compliance with TIA/EIA-568.B standards and BICSI recommended methods.
  9. Tight 90-degree bends are unacceptable, and use of plastic "cinch-type" tie-wraps are not permitted, in order to prevent damage to cable jacket and compromise the cable's electrical or optical characteristics.
  10. Cable bundles shall be neatly routed with a service loop to provide 10 feet of slack at the cross-connect end and as noted in the T-drawings. Cable bundles shall be secured using only black Velcro cable wraps.
- B. Install all exposed cabling in surface raceway by Wiremold, Hubbell or Panduit where in-wall conduit has not been provided. Follow all manufacturers' guidelines requirements regarding bending radius and slack. All bends, offsets and fittings shall be appropriately sized to provide 30% capacity after installation.
- C. Install all cable in accordance with National, state and local codes and ANSI/TIA/EIA Standards, and BICSI methods.
1. Follow manufacturer's guidelines and requirements for all cable termination.
  2. Identification: Provide permanent identification labels for patch panels, access panels and entrance facilities.

### 3.4 Testing

#### A. Intrusion Detection System

1. Upon completion of work, all parts of the systems installation shall be tested by the installing Contractor and demonstrated free of any defects. Preliminary testing will be permitted but shall not be accepted in lieu of obtaining final test results. Final test results shall be accomplished by the use of proper test equipment for the system being tested.
2. Each device shall be demonstrated to individually alarm and pin point the exact triggered sensor. Any system failing this requirement will be wholly rejected at the contractor's expense.
3. Re-terminate and re-test any cables or pairs of cables failing end-to-end testing requirements. Replace any faulty cables/pairs or termination devices. Remove all defective cables completely from pathways.

### 3.5 As-Builts

- A. All devices shall be shown in their accurate location

- B. All equipment and cables shall be properly identified and labeled.
- C. Accurate as-built drawings shall be provided in electronic and hard copy format.
  - 1. 3 copies of electronic (CAD) drawings shall be distributed on appropriate media: 1 to construction management, 1 to designers and 1 to school district personnel.
  - 2. 3 hard copies of CAD drawings shall be plotted on full size sheets and test results of every installed cable have been given to the construction management for appropriate distribution.

### 3.6 Demonstration

- A. Intrusion Systems Demonstration
  - 1. 16 Hours of demonstration and training on all aspects of the completely installed systems must be provided for the owner.
    - a. Training shall be video recorded for the owner and given to them after acceptance.
    - b. Training and system demonstration must include all aspects of the system and its operation.
    - c. Additional training, beyond the initial 16 hours, shall be provided for the owner at their request on an hourly rate basis.

### 3.7 Acceptance

- A. Contractors work shall be considered complete after the following conditions have been met:
  - 1. Cable and equipment installation is complete and all cables and equipment have been tested and documented to be installed according to specifications and drawings. Use form at the bottom of this specification for zone descriptions and delineation.
  - 2. A school district Security representative has successfully tested the "LIVE" system.
  - 3. All punch list items have been reconciled.
  - 4. All disturbed ceiling panels, covers, etc. have been properly reinstalled.
  - 5. All materials and trash have been removed from the site.
  - 6. A 1-Year Installers warranty has been given to a school district Security representative.
  - 7. Submit Manufacturers Extended Warranty Application.

DELAWARE TECHNICAL COMMUNITY COLLEGE  
GEORGE CAMPUS - EAST BUILDING

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Subscriber Name \_\_\_\_\_

☐ **ADDENDUM** TO A NEW SUBSCRIBER MONITORING AGREEMENT.  
☐ **CHANGE** TO DATA ON AN EXISTING SUBSCRIBER ACCOUNT.

FOR YOUR CONVENIENCE, PANEL PRINT OLITS ARE ACCEPTED. **HOWEVER**, PLEASE INDICATE CALLBACK OPTION. EXCLUSION OF THIS INFORMATION MAY DELAY THE PROCESSING OF A SUBSCRIBER MONITORING AGREEMENT. IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT YOUR SALES REPRESENTATIVE.

PANEL: ☐ DSC OTHER (SPECIFY) \_\_\_\_\_  
 PARTITIONED: ☐ NO ☐ YES (DEFINE BELOW)

1	5
2	6
3	7
4	8

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Tetra Tech  
200-35157-19002

**SECTION 28 11 00**  
**ACCESS CONTROL SYSTEM**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Access Control cabling
- B. Access Control sensors
- C. Access Control devices
- D. Access Control headend equipment
- E. Access Control Hardware, Panels, Nodes, Card Readers, Servers, Software and associated cabling.
- F. Associated power supplies, terminations, equipment, labeling and associated cable performance testing.

1.2 Definitions

- A. Access Control system refers to system database to allow or prevent access to the facility.
- B. Access Control system refers equipment including card readers, door controllers, access control panels, access control cards, access control database, door contacts, control panels, communication panels, power supplies, expansion modules and associated wiring.

1.3 System Description

- A. Design Requirements
  - 1. Provide labor, materials, equipment, services and operations required for complete installation of an integrated Access Control System.
  - 2. Remote Access
    - a. The system shall provide a method for users to remotely access the system and perform all of the functions possible on an operator terminal by LAN (IP). Provide Cat 6 cable and associated connections to school's data network. Install associated software on all administrative and custodial office computers (pc's) for controlling and monitoring system. Turn over software disc to owner after installations.
  - 3. Provide labor, materials, equipment, services and operations required for a complete installation of an Access Control System.
    - a. Base panel
    - b. Expansion modules
    - c. Card Readers
    - d. Door Controllers
    - e. Communication Modules



- f. Power Supplies
  - g. Controllers
  - h. Servers
  - i. Cabling and connectors
  - j. Application Software
4. All wiring shall be wired according to manufactures specifications.
- a. Refer to notes on each drawing to determine exact installation methods.
  - b. Strictly adhere to most current version of TIA/EIA Telecommunications cabling standards.
  - c. Permanently identify and label all cables and termination devices, at distribution rack and workstation in accordance with ANSI TIA/EIA-606 Standard or as agreed by Design consultant and Authority.
  - d. Remove and replace any cables failing to meet end-to-end testing requirements; do not abandon cable in place. All cable shall be terminated at both ends, unless noted in T-Drawings.

B. Performance Requirements

C. Access Control System Requirements

- 1. The system shall interface with the Building Controls System at the facility.
- 2. The system shall allow or prevent access to the facility and certain areas of the facility
- 3. The system shall provide notification of events occurring on the system
- 4. The system shall be on emergency power systems
- 5. The system shall be on the local area network
- 6. The system shall be connected to the Intrusion Detection System, Video Surveillance System and electric locking systems at the facility
- 7. The system shall integrate with other currently installed systems within the district.
- 8. The system shall allow for a key to override any lock.
- 9. The system shall be field controllable and programmable.
- 10. The system shall allow for instantaneous deletion of a card holder from the system.
- 11. The system shall allow for access restriction.
- 12. The system shall have a backup database.
- 13. Contractor shall be responsible for form, fit, function, and coordination of all part numbers listed above, and bring to owner's attention any changes or substitutions for approval.

14. Indoor/outdoor card readers shall be recessed. No exposed conduit shall be used.
15. No surface metal raceway shall be used unless approved by owner, and if approved, shall be painted to match adjacent wall color.
16. The system shall be capable of being scheduled.
17. The systems will be capable of communicating onsite as well as to remote locations.
18. The systems shall be controllable in case of emergency situation.
19. All systems shall operate on dedicated circuits with associated cabling in EMT.

D. Codes

1. Comply with applicable requirements in Local, State and Federal Codes, TIA/EIA Standards, and BICSI methodology.
2. Specified cabling system derived from recommendations in approved telecommunications industry codes, standards and methods, including the following documents:
3. ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises.
4. ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
5. ANSI/TIA-568-C.2: Balanced Twisted Pair Cabling and Components Standard
6. ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standard
7. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
8. ANSI/TIA-570-B: Residential Telecommunications Cabling Standard
9. ANSI/TIA-606-A: Administration Standard for Telecommunications Infrastructure of Commercial Buildings
10. ANSI-J-STD-607-A: Commercial Building Grounding and Bonding Requirements for Telecommunications
11. ANSI/TIA-758-A: Customer-Owned Outside Plant Telecommunications Cabling Standard
12. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition

1.4 National Fire Protection Agency (NFPA-70): National Electrical Code (NEC) Submittals

- A. Comply with requirements of Division 0 and Division 1 - Submittals and as modified below.
- B. Product Data: Submit manufacturer's product literature, technical specifications and similar information for the following items demonstrating compliance with the specified requirements.
  1. Card Readers

2. Network nodes
  3. Network Node cards
  4. Access Controllers
  5. Headend Control Panels and Communications Modules
  6. Power supplies
  7. Copper cable and termination devices.
  8. Inner duct and accessories.
  9. Wiring diagrams.
  10. Servers
- C. Samples: Provide samples of assemblies and connections as described below, prior to installation, for approval by designer.
1. Access Control cables and devices – Submit samples of cables and terminations to be provided including following components and characteristics:
    - a. Provide all components in colors selected by Design consultant.
- D. Quality Control Submittal
1. Test Reports: Submit complete sample test data and reports with exact labels used on cables termination fields.
  2. Certificates
    - a. Manufacturer Certification: Submit certification from manufacturer of products to be installed under this contract certifying that Installer is authorized by manufacturer to install specified products.
    - b. Installer Experience Listing: Submit list of at least 5 completed projects as specified below in “Quality Assurance – Qualifications – Installer.”
- E. Contract Closeout Submittal: Comply with requirements of Division 0, including submission of operating and maintenance instructions as item in “Operation and Maintenance Data” manual described in that Section.
- 1.5 Quality Assurance
- A. All Work shall be installed in a first class, neat and workmanlike manner by skilled Technicians. The quality of the workmanship shall be subject to inspection and approval by authorized school district personnel. Any work found to be of inferior quality and/or workmanship shall be replaced and/or reworked until the approval of school district personnel is obtained.
- B. Qualifications
1. Installer

- a. Qualified to cable, terminate, program and test Access Control systems, and associated power wiring specified in this Section and other Division 17000 series specifications, certified by manufacturer of products to be installed, and completed at least 5 installations of similar size, nature and complexity as specified for this project.
- C. Conditions for Consideration of "Or Equal" Products: Where products are specified by name and accompanied by the term "or equal", the proposed "or equal" product will be considered when the following conditions are satisfied. If all the following conditions are not satisfied, Design Consultant will return requests without action, except to record noncompliance with these requirements:
  1. Proposed product does not require extensive revisions to the Contract Documents.
  2. With the exception of the product name or number and manufacturer's name, proposed product conforms with requirements indicated on the Drawings and in the Specifications in every respect and will produce indicated results.
  3. Proposed product is fully documented and properly submitted.
  4. Proposed product has received necessary approvals of authorities having jurisdiction.
  5. Proposed product is compatible with AND has been coordinated with other portions of the Work.
  6. Proposed product provides specified warranty.
  7. If proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
  8. Submission is accompanied with detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  9. Submission is accompanied with a list of similar installations for completed projects with project names and addresses and names and addresses of design consultants and authorities, if requested.
  10. Submission is accompanied with proposed product's Manufacturer signed written statement on Manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents.

#### 1.6 Warranty

- A. Installer's Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.
- B. A fifteen (15) year Extended Product Warranty and Systems Assurance Warranty for UTP wiring system shall be provided by the Manufacturer as follows:
  1. System Certification: Upon successful completion of the installation and subsequent inspection, the Authority shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

1.7 Training

- A. Installing contractor shall provide a minimum of 8 hours of training on system operation and managements as part of their scope of work.
  - 1. Additional hours shall be provided on a time and materials basis at the request of the owner.
- B. Installing contractor shall provide a video recording on a standard format solid state drive to the owner which includes training sessions.

1.8 Operation And Maintenance Manuals

- A. Installing contractor shall provide a minimum of two hardcopy and one electronic copy of all operation and maintenance manuals to the owner at project completion.

**PART 2 - PRODUCTS**

2.1 Manufacturers

- A. Basis of Design
  - 1. Honeywell Prowatch (No Substitutions)
  - 2. "Sole Source – No substitutions
- B. Access Control Software
  - 1. Pro-Watch Enterprise Edition
- C. Access Control Panel
  - 1. Honeywell PW6K1IC
- D. Intelligent Controller
  - 1. Honeywell PW6KICE
- E. Access Control Door Controller
  - 1. Honeywell Security PW6K1R1
  - 2. Honeywell Security PW6K1R1E
  - 3. Honeywell Security PW6K1R2
- F. Alarm Input Module
  - 1. Honeywell PW6K1IN
- G. Relay Output Module
  - 1. Honeywell PW6K1OUT
- H. Access Control Card Reader
  - 1. Honeywell OmniProx
  - 2. Honeywell OmniAssure
  - 3. Honeywell OmniClass
  - 4. Honeywell DigiReaders

- I. Access Control Cards
  - 1. HID multiclass SE
- J. Access Control Cabling
  - 1. Cat 6 UTP
  - 2. 6 conductor Card Reader Cabling
  - 3. Cabling per manufacturer's specifications.
- K. The system shall provide a method for users to remotely access the system and perform all of the functions possible on an operator terminal by LAN (IP). Provide Cat 6 cable and associated connections to school's data network. Install associated system software on all administrative and custodial office computers (pc's) for controlling and monitoring system. Turn over software disc to owner after installations.
- L. System Requirements
  - 1. Furnish and install all system equipment including, but not limited to, the following:
    - a. Access Power Controller, for interface with school's fire alarm panel.
    - b. Network Interface Module, for IP network link communications.
    - c. Card readers with LED, indoor/outdoor design.
    - d. Access Card, quantity of one-hundred (100).
    - e. Power supply. Quantity as required to support system.
    - f. Standby batteries. Quantity as required to support system for specified hours upon loss of power. It is the responsibility of contractor to coordinate with other trades to fulfill this requirement regardless if shown on contract drawings (electrical drawings).
  - 2. Each door associated with card reader shall be equipped and wired to control panels with:
    - a. Request-to-exit Sensor if door hardware does not provide lock release.
    - b. Push-to-exit Pushbutton where required based on lock types.
  - 3. Contractor shall be responsible for form, fit, function, and coordination of all part numbers listed above, and bring to owner's attention any changes or substitutions for approval.
- M. Indoor/outdoor card readers shall be recessed. No exposed conduit shall be used.
- N. Wiring:
  - 1. Provide Allied True Color products, or equal. All junction boxes are to be painted green to match conduit. All wiring shall be concealed. No surface metal raceway shall be used unless approved by owner, and if approved, shall be painted to match adjacent wall color.
  - 2. Access Card/FOB, Quantity of one hundred (100).
  - 3. Power supply. Quantity as required to support system.
  - 4. Standby batteries. Quantity as required to support system for specified hours upon loss of power. Note: Card access system shall be fed from school's emergency generator power

source. It is the responsibility of contractor to coordinate with other trades to fulfill this requirement regardless if shown on contract drawings (electrical drawings).

5. Request-to-exit Sensor, Detection Systems, DS160 series with activation LED on doors where hardware does not provide egress and/or for system shunt.

### PART 3 - EXECUTION

#### 3.1 Examination

- A. Verification of Conditions: Examine conditions under which Access Control cabling and equipment and related components are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Design consultant in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected to ensure a safe and timely installation.
  1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Design consultant written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.
  2. Visit Site to identify and become familiar with existing field conditions and specific requirements of each Site.
  3. Verify all dimensions in field and confirm condition of existing hardware to be utilized.
  4. Confirm space requirements and physical confines of all work areas to ensure that all materials can be installed in indicated spaces.
  5. Confirm all outlet locations and cable pathways and advise Design consultant in writing of any discrepancies or issues in Design described in Contract Documents.

#### 3.2 Preparation

- A. Protection: Provide adequate protection of equipment and hardware before and after installation.

#### 3.3 Installation

- A. Provide and install all components necessary to install a complete Access Control System, including (but is not limited to) connectors, sensors, panels, power supplies, terminators, etc...
  1. Cable runs shall be per manufacturer's recommendations in all cases. Any deviation will result in system rejection.
  2. Secure all horizontal cables within ceiling cavities to building structure.
  3. Loosely bundle all cables and support from structure at unequal intervals from 5 to 6 feet with spring steel fasteners and cable clip rated for use with high performance cables where cable tray or other support structure has not been provided as indicated on Drawings. All mounting clips shall be seismic type as per BOCA.

4. Do not violate manufacturer's recommended loadings. Leave 30% capacity for future use of pathway.
  5. Do not support cables from ceiling grid T-Bars, grid wire supports or bridle rings. Do not allow cables to touch ceiling grid.
  6. Install cables in EMT conduit in all unfinished, exposed areas as shown in Design consultant and Architectural roof plans and/or T-Drawings, unless alternate pathways are noted.
  7. Do not secure cables with permanent cable ties. Do not tighten cable bundles in such a way as to cause jacket deformation
  8. Place cables in compliance with TIA/EIA-568.B standards and BICSI recommended methods.
  9. Tight 90-degree bends are unacceptable, and use of plastic "cinch-type" tie-wraps are not permitted, in order to prevent damage to cable jacket and compromise the cable's electrical or optical characteristics.
  10. Cable bundles shall be neatly routed with a service loop to provide 10 feet of slack at the cross-connect end and as noted in the T-drawings. Cable bundles shall be secured using only black Velcro cable wraps.
- B. Install all exposed cabling in surface raceway by Wiremold, Hubbell or Panduit where in-wall conduit has not been provided. Follow all manufacturers' guidelines requirements regarding bending radius and slack. All bends, offsets and fittings shall be appropriately sized to provide 30% capacity after installation.
- C. Install all cable in accordance with National, state and local codes and ANSI/TIA/EIA Standards, and BICSI methods.
1. Follow manufacturer's guidelines and requirements for all cable termination.
  2. Identification: Provide permanent identification labels for patch panels, access panels and entrance facilities.

### 3.4 Testing

#### A. Access Control System

1. Upon completion of work, all parts of the systems installation shall be tested by the installing Contractor and demonstrated free of any defects. Preliminary testing will be permitted but shall not be accepted in lieu of obtaining final test results. Final test results shall be accomplished by the use of proper test equipment for the system being tested.
2. Each device shall be demonstrated individually and provide all functions as specified by the manufacturer's literature. Any system failing this requirement will be wholly rejected at the contractor's expense.
3. Re-terminate and re-test any cables or pairs of cables failing end-to-end testing requirements. Replace any faulty cables/pairs or termination devices. Remove all defective cables completely from pathways.



### 3.5 As-Builts

- A. All devices shall be shown in their accurate location with associated wiring.
- B. All equipment and cables shall be properly identified and labeled.
- C. Accurate as-built drawings shall be provided in electronic and hard copy format.
  - 1. 3 copies of electronic (CAD) drawings shall be distributed on appropriate media: 1 to construction management, 1 to designers and 1 to school district personnel.
  - 2. 3 hard copies of CAD drawings shall be plotted on full size sheets and test results of every installed cable have been given to the construction management for appropriate distribution.

### 3.6 Demonstration

- A. Access Control Systems Demonstration
  - 1. 8 Hours of demonstration and training on all aspects of the completely installed systems must be provided for the owner.
    - a. Training shall be video recorded for the owner and given to them after acceptance.
    - b. Training and system demonstration must include all aspects of the system and its operation.

### 3.7 Acceptance

- A. Contractors work shall be considered complete after the following conditions have been met:
  - 1. Cable and equipment installation is complete and all cables and equipment have been tested and documented to be installed according to specifications and drawings
  - 2. A school district Security and Technology representative has successfully tested the "LIVE" system.
  - 3. All programming has been provided and entered into the system including users and specific restrictions per card.
  - 4. All punch list items have been reconciled.
  - 5. All disturbed ceiling panels, covers, etc. have been properly reinstalled.
  - 6. All materials and trash have been removed from the site.
  - 7. A 1-Year Installers warranty has been given to a school district Security representative.
  - 8. Submit Manufacturers Extended Warranty Application.

END OF SECTION

**SECTION 28 20 00**  
**VIDEO SURVEILLANCE SYSTEM**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Video Surveillance Cabling, Cameras and interface units.
- B. Associated power supplies, terminations, labeling and associated cable performance testing.
- C. All materials, terminations, equipment, labeling and associated cable performance testing.

**1.2 Definitions**

- A. Refer to sections 27 and 28 for applicable definitions and terms.
- B. CCTV and video surveillance refer to the same system and are used interchangeably. Terms refer to cabling system included in this specification section.

**1.3 System Description**

**A. Design Requirements**

- 1. Provide labor, materials, equipment, services and operations required for complete installation of a CCTV.
  - a. Cat 6 UTP network cables with all terminations from cameras to switches and control equipment shall be installed without splicing.
  - b. Cables shall be routed from distribution racks throughout building as shown on T-Drawings.
    - i. Refer to notes on each drawing to determine exact installation methods.
    - ii. Note and record all cable lengths to the nearest foot.
    - iii. Strictly adhere to most current version of ANSI/TIA Telecommunications cabling standards.
  - c. Permanently identify and label all cables and termination devices, at distribution rack and workstation in accordance with ANSI/TIA-606 Standard or as agreed by Design consultant and Authority.
  - d. Remove and replace any cables failing to meet end-to-end testing requirements; do not abandon cable in place. All cable shall be terminated at both ends, unless noted in T-Drawings.

**B. CCTV System Requirements**

- 1. Provide manufacturer's data sheet for each camera model.
- 2. All cameras must be ONVIF conformant. Vendor must provide ONVIF conformance website link for each camera model.
- 3. ONVIF conformance website: <https://www.onvif.org/conformant-products/>

4. Built-in microphone not required but list if included for each camera model.
5. No 360° multi-sensor cameras are permitted.
6. Interior purpose, vandal proof cameras/housings.
7. The system shall provide notification of events occurring on the system.
8. The system shall be on emergency power systems/circuits.
9. The system shall be on the local area network.
10. The system shall integrate with other currently installed systems within the district.
11. The system shall be field controllable and programmable.
12. The system shall allow for access restriction.
13. Contractor shall be responsible for form, fit, function, and coordination of all part numbers listed above, and bring to owner's attention any changes or substitutions for approval.
14. No surface metal raceway shall be used unless approved by owner, and if approved, shall be painted to match adjacent wall color.

C. Performance Requirements

1. Comply with applicable requirements in Local, State and Federal Codes, TIA/EIA Standards, and BICSI methodology.
2. Specified cabling system derived from recommendations in approved telecommunications industry codes, standards and methods, including the following documents:
  - a. ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises.
  - b. ANSI/TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
  - c. ANSI/TIA-568-C.2: Balanced Twisted Pair Cabling and Components Standard
  - d. ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standard
  - e. ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces
  - f. ANSI/TIA-570-B: Residential Telecommunications Cabling Standard
  - g. ANSI/TIA-606-A: Administration Standard for Telecommunications Infrastructure of Commercial Buildings
  - h. ANSI-J-STD-607-A: Commercial Building Grounding and Bonding Requirements for Telecommunications
  - i. ANSI/TIA-758-A: Customer-Owned Outside Plant Telecommunications Cabling Standard

- j. BICSI Telecommunications Distribution Methods Manual (TDMM), Latest Edition
- k. National Fire Protection Agency (NFPA-70): National Electrical Code (NEC)

#### 1.4 Submittals

- A. Comply with requirements of Division 0 and Division 1 - Submittals and as modified below.
- B. Product Data: Submit manufacturer's product literature, technical specifications and similar information for the following items demonstrating compliance with the specified requirements.
  - 1. Video Recorder Units (NVRs)
  - 2. Cameras
  - 3. Copper cable, patch cables and termination devices
  - 4. Video Surveillance Control Software
  - 5. Video Surveillance Control Servers
  - 6. Inner duct and accessories
  - 7. Complete Wiring diagrams
  - 8. Sample of each cable test report.
- C. Shop Drawings
  - 1. All aspects of the system shall be shown diagrammatically and include locations and quantities on floor plans.
- D. Samples: Provide samples of assemblies and connections as described below, prior to installation, for approval by designer.
  - 1. CCTV cables and connections – Submit samples of cables and terminations to be provided including following components and characteristics:
    - a. Provide all components as specified by Design consultant.
- E. Quality Control Submittal
  - 1. Test Reports: Submit complete sample test data and reports with exact labels used on cables and patch panels
  - 2. Certificates
    - a. Manufacturer Certification: Submit certification from manufacturer of products to be installed under this contract certifying that Installer is authorized by manufacturer to install specified products.
    - b. Installer Experience Listing: Submit list of at least 5 completed projects as specified below in "Quality Assurance – Qualifications – Installer."

- F. Contract Closeout Submittal: Comply with requirements of Division 0, including submission of operating and maintenance instructions as item in "Operation and Maintenance Data" manual described in that Section.

1.5 Quality Assurance

- A. All Work shall be installed in a first class, neat and workmanlike manner by skilled technicians. The quality of the workmanship shall be subject to inspection and approval by authorized SCPS personnel. Any work found to be of inferior quality and/or workmanship shall be replaced and/or reworked until the approval of SCPS is obtained.
- B. Qualifications
1. Installer
    - a. Qualified to cable, terminate and test data network cabling system, coaxial cable system and associated power wiring specified in this Section and section 271000, certified by manufacturer of products to be installed, and completed at least 5 installations of similar size, nature and complexity as specified for this project.
- C. Conditions for Consideration of "Or Equal" Products: Where products are specified by name and accompanied by the term "or equal", the proposed "or equal" product will be considered when the following conditions are satisfied. If all the following conditions are not satisfied, Design Consultant will return requests without action, except to record noncompliance with these requirements:
1. Proposed product does not require extensive revisions to the Contract Documents.
  2. With the exception of the product name or number and manufacturer's name, proposed product conforms with requirements indicated on the Drawings and in the Specifications in every respect and will produce indicated results.
  3. Proposed product is fully documented and properly submitted.
  4. Proposed product has received necessary approvals of authorities having jurisdiction.
  5. Proposed product is compatible with AND has been coordinated with other portions of the Work.
  6. Proposed product provides specified warranty.
  7. If proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
  8. Submission is accompanied with detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
  9. Submission is accompanied with a list of similar installations for completed projects with project names and addresses and names and addresses of design consultants and authorities, if requested.

10. Submission is accompanied with proposed product's Manufacturer signed written statement on Manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents.

#### 1.6 Warranty

- A. Installer's Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.
- B. A fifteen (15) year Extended Product Warranty and Systems Assurance Warranty for UTP camera wiring system shall be provided by the Manufacturer as follows:
  1. System Certification: Upon successful completion of the installation and subsequent inspection, the Authority shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Basis of Design - Avigilon
- B. Equipment Rack/Cabinets
  1. See Section 270500 for acceptable equipment.
- C. Cabling Components for Video Surveillance Systems.
  1. Vendor (or vendor's subcontractor) must be Hubble, Beldin, or ICC certified; and provide current company certification document. Vendor must explicitly identify all cabling subcontractors (company name, address, phone, primary contact), if any.
  2. Vendor (and/or vendor's subcontractor) must follow latest Delaware State-Wide Information Technology and Architecture Standards; Structured Cabling System Standards and Specifications for State-Managed Facilities.  
<https://webfiles.dti.delaware.gov/pdfs/pp/CablingAndWiringStandard.pdf>
  3. All data structured cabling must be certified using a Fluke DTS-5000, Fluke DSX-8000, or DTCC approved equivalent, at the following data rates: CAT6 - 1 Gbps, CAT6A - 10 Gbps.
  4. All cabling certification equipment must be Intertek conformant. Vendor must provide Intertek conformance website link for all certification equipment used.  
<http://www.intertek.com/ETL-Verified-Directory/Cabling-Products/>
  5. Vendor must provide copy of latest manufacturer's (or manufacturer's authorized servicing company) cabling certification equipment calibration document, not to exceed more than one year in age prior to date of proposal.
  6. Horizontal Cat 6 UTP Camera Cabling (Plenum Rated)
    - a. CCTV System cabling shall be a distinct color from other systems
    - b. Camera cabling shall provide identical performance to Cat 6 UTP data and voice cabling included in Section 27 10 00 and meet all district performance criteria.
    - c. Physical Characteristics

- i. 100 Ohm Category 6 Unshielded Twisted Pair Cable (UTP)
  - ii. Meeting requirements of ANSI/ICEA S-80-576. For cables not specified in “Approved Components” paragraph, all 4 pairs insulated with F.E.P. providing maximum 0.023-inch diameter of insulated conductor.
  - iii. Security data cable shall be green in color
  - iv. Acceptable Cable
    - (a) See section 27 10 00
    - (b) Or Approved Equivalent
- 7. Fiber Optic Strands (Plenum Rated)
  - a. Singlemode Fiber
    - i. See Section 27 10 00 for acceptable backbone fiber.
- 8. Patch Panels for CCTV Cabling
  - a. All patch panels must provide identical performance to Cat 6 patch panels included in Section 27 10 00 and meet all district performance criteria
  - b. Panels shall contain the number of termination ports required to terminate all camera jacks in service area, plus 20% spare capacity.
  - c. Acceptable units:
    - i. See section 27 10 00
    - ii. Or approved equivalent.
- 9. Patch Cables for CCTV Cabling
  - a. Factory terminated and tested UTP patch cables at workstation and equipment cross-connect meeting requirements of ANSI/TIA/EIA-568-B for patch cable testing.
    - i. See Section 27 10 00 for acceptable patch cables.
- 10. Power Wiring (if required beyond POE switches)
  - a. Wires shall be approved for use in plenum rated spaces.
  - b. Power wiring shall be approved by the CCTV manufacturer for use with the CCTV system.
  - c. 14/2 AWG copper cable.

D. CCTV Electronics

- 1. Network IP Cameras
  - a. IP Network Cameras w/built-in 100 Mb/s (or higher) Ethernet port.
  - b. Camera power provided via POE or POE+ Ethernet port.

- c. 5 megapixel (MP) or higher on single sensor camera, 12 megapixel (MP) or higher on 180° multi-sensor camera.
  - d. 20-meter or higher infrared (IR) night illumination.
  - e. H.264 and/or H.265 video compression.
  - f. Built-in microphone (list Y or N).
  - g. ONVIF conformant camera (list ONVIF website reference link for each camera model).
  - h. Capable of 2 video streams or higher per camera (list concurrent streams capability per camera model).
  - i. Vandal proof.
  - j. 5-year minimum warranty on camera and network POE+ switch equipment; date to begin on
  - k. DTCC acceptance date.
- 2. Licenses
  - a. One Per camera.
- 3. Network Switches
  - a. HPE Flex Network 5130 24G PoE+ 4SFP
- 4. Monitors
  - a. Pelco 32" 1080P PMCL632
- 5. Rack Monitor
  - a. 19" SMK-920
- 6. UPS
  - a. Basis of Design – APC 3000 120VAC UPS

### PART 3 - EXECUTION

#### 3.1 Examination

- A. Verification of Conditions: Examine conditions under which CCTV and Access Control cabling and equipment and related components are to be installed in coordination with Installer of materials and components specified in this Section and notify affected Prime Contractors and Design consultant in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected to ensure a safe and timely installation.
  - 1. When Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Design consultant written confirmation from applicable Installer. Failure to submit



written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Installer.

2. Visit Site to identify and become familiar with existing field conditions and specific requirements of each Site.
3. Verify all dimensions in field and confirm condition of existing hardware to be utilized.
4. Confirm space requirements and physical confines of all work areas to ensure that all materials can be installed in indicated spaces.
5. Confirm all outlet locations and cable pathways and advise Design consultant in writing of any discrepancies or issues in Design described in Contract Documents.

### 3.2 Preparation

- A. Protection: Provide adequate protection of equipment and hardware before and after installation.
- B. Existing Communications Services: Ensure all telecommunications systems (voice, video and data) remain operational throughout the project.
  1. Identify any circuits and/or wiring at the site not shown on T-Drawings and interfering with installation of specified Equipment.
  2. Remove all accessible portions of abandoned communications cabling per NEC 800.52. Tag all communications cabling not terminated at both ends but retained for future use.

### 3.3 Installation

- A. Provide and install all components necessary to install complete telecommunications cabling and equipment systems, including (but is not limited to) connectors, patch cables, terminators, etc...
  1. Cable runs shall be continuous and unbroken from end to end. Splicing of any LAN, Horizontal, Homerun multi conductor cable or coaxial video distribution cable is prohibited.
  2. Secure all horizontal cables within ceiling cavities to building structure.
  3. Loosely bundle all cables and support from structure at unequal intervals from 5 to 6 feet with spring steel fasteners and cable clip rated for use with high performance cables where cable tray or other support structure has not been provided as indicated on Drawings. All mounting clips shall be seismic type as per BOCA.
  4. Do not violate manufacturer's recommended loadings. Leave 30% capacity for future use of pathway.
  5. Verify all horizontal cable run lengths prior to installation. Re-distribute horizontal cabling to maintain distance requirements and maintain pathway route accessibility.
  6. Do not support cables from ceiling grid T-Bars, grid wire supports or bridle rings. Do not allow cables to touch ceiling grid.

7. Install cables in EMT in all unfinished, exposed areas as shown in Design consultant and Architectural roof plans and/or T-Drawings, unless alternate pathways are noted.
  8. Do not secure cables with permanent cable ties. Do not tighten cable bundles in such a way as to cause jacket deformation or damage.
  9. Provide a minimum of 15' of cable slack at camera location and 10 feet at patch panels, unless noted otherwise. Do not coil cable slack
  10. Place cables in compliance with ANSI/TIA-568.C standards and BICSI recommended methods.
  11. Tight 90-degree bends are unacceptable, and use of plastic "cinch-type" tie-wraps are not permitted, in order to prevent damage to cable jacket and compromise the cable's electrical or optical characteristics.
  12. Cable bundles shall be neatly routed with a service loop to provide 10 feet of slack at the cross-connect end and as noted in the T-drawings. Cable bundles shall be secured using only black Velcro cable wraps.
  13. 10 feet of service slack shall be provided in the ceiling at each device location. Contractor shall not secure service loop in coils, but route in such a manner as to minimize EMI.
- B. Install all exposed cabling in surface raceway by Wiremold, Hubbell or Panduit where in-wall conduit has not been provided. Follow all manufacturers' guidelines requirements regarding bending radius and slack. All bends, offsets and fittings shall be appropriately sized to provide 30% capacity after installation.
- C. Install all cable in accordance with National, state and local codes and ANSI/TIA Standards, and BICSI methods.
1. Follow manufacturer's guidelines and requirements for all cable termination.
- D. Properly terminate all cables at camera locations and distribution racks. Permanently identify all cables in pullboxes, transition points, and termination points by affixing pre-marked self-adhesive wraps similar to Brady "B-500+ Plastic Cloth Markers."
- E. Permanently identify all system components following ANSI/TIA 606 "Administration Standard for Commercial Telecommunications Infrastructure" with identification format:
1. Identification: Provide permanent identification labels for patch panels, access panels and entrance facilities.

### 3.4 Testing

#### A. Video Surveillance System

1. Upon completion of work, all parts of the telecommunications installation shall be tested by the low voltage Contractor and demonstrated free of any defects. Preliminary testing will be permitted but shall not be accepted in lieu of obtaining final test results. Final test results shall be accomplished by the use of proper test equipment for the system being tested.

2. Re-terminate and re-test any cables or pairs of cables failing end-to-end testing requirements. Replace any faulty cables/pairs or termination devices. Remove all defective cables completely from pathways.
3. All aspects of the management and control system shall be tested and shown to operate as specified by the manufacturer.

### 3.5 As-Built

- A. Accurate as-built drawings shall be provided in electronic and hard copy format.
  1. 3 copies of electronic (CAD) drawings shall be distributed on appropriate media: 1 to construction management, 1 to designers and 1 to the school district.
  2. 3 hard copies of CAD drawings shall be plotted on full size sheets and test results of every installed cable have been given to the construction management for appropriate distribution.
- B. As-builts shall accurately show all devices, wiring, control equipment, rack elevations, equipment elevations and system interconnections.

### 3.6 Demonstration

- A. Video Systems Demonstration
  1. 8 Hours of demonstration and training on all aspects of the completely installed systems must be provided for the owner.
    - a. Training shall be video recorded for the owner and given to them after acceptance.
    - b. Training and system demonstration must include all aspects of the system and its operation.

### 3.7 Acceptance

- A. Contractors work shall be considered complete after the following conditions have been met:
  1. Cable installation is complete and all cable runs have been tested and documented to be installed according to specifications and drawings.
  2. Equipment installation is complete and all aspects of the system have been shown to operate as per manufacturer's specifications.
  3. A school district security representative has successfully tested the "LIVE" system.
  4. All punch list items have been reconciled.
  5. All disturbed ceiling panels, covers, etc. have been properly reinstalled.
  6. All materials and trash have been removed from the site.
  7. A 1-Year Installers warranty has been given to a school district Security representative.
  8. Submit Manufacturers Extended Warranty Application.

END OF SECTION